SMITH, GAMBRELL & RUSSELL, LLP
ATTORNEYS AT LAW
SUITE 800
1850 M STREET, N.W.
WASHINGTON, D.C. 20036
TELEPHONE (202) 659-2811
FACSIMILE (202) 263-4329
WEBSITE: wwwsgrlawcom

ESTABLISHED 1893

ATLANTA OFFICE
SUITE 3100, PROMENADE II
1230 PEACHTREE STREET, N E
ATLANTA, GEORGIA 30309-3592
TELEPHONE
(404) 815-3500
FACSIMILE
(404) 815-3509

FLORIDA OFFICE
SUITE 2200, BANK OF AMERICA TOWER
50 NORTH LAURA STREET
JACKSONVILLE, FL 32202
TELEPHONE
(904) 358-2222
FACSIMILE
(904) 358-3407

November 28, 2000

Asst. Commissioner for Patents
Washington, D.C. 20231

PATENT APPLICATION TRANSMITTAL LETTER
Inventor(s): Hirofumi WADA et al.
PROGRAM RECORDING APPARATUS AND PROGRAM RECORDING MEDIUM
Attorney Docket No.: 33216M061

Sir:

Transmitted herewith for filing are the following:

New patent application including 63 pages of text, 21 sheets of formal drawings, signed Declaration, signed Assignment and Recordation Cover Sheet, Preliminary Amendment, Claim For Foreign Priority with a certified copy of the foreign priority document and a check for **$1,128.00**.

Counsel's check for the fee which has been calculated as shown below.

Basic Fee	$ 710.00
Additional Claims Fee (26 - 20 = 6 x $18.00 = 108.00)	108.00
Multiple Dependent Claims Fee	270.00
Assignment Fee	$ 40.00
TOTAL:	**$1,128.00**

If any additional fees associated with this communication are required, please notify the undersigned attorney by telephone and charge the fees to Deposit Account 02-4300.

This includes, for example, any additional filing fees required under 37 CFR 1.16 and any patent application processing fees under 37 CFR 1.17.

Respectfully submitted,

By_____
Michael A. Makuch
Reg. No. 32,263

Atty. Dkt No.
33216M061

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Hirofumi WADA et al.

U.S. Serial No.: To Be Assigned — Group Art Unit: To Be Assigned

Filed: : November 28, 2000 (Herewith) — Examiner: To Be Assigned

For : PROGRAM RECORDING APPARATUS AND PROGRAM RECORDING MEDIUM

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to or concurrent with calculation of the filing fees, please amend this application as follows.

IN THE CLAIMS:

Please amend claims 7-9 and 13 as follows.

Claim 7, lines 1 and 2, change "any of Claims 1 to 6" to --either of Claims 1 or 2--.

Claim 8, lines 1 and 2, change "any of Claims 1 to 6" to --either of Claims 1 or 2--.

Claim 9, lines 1 and 2, change "either of Claims 5 or 6" to --Claim 5--.

Claim 13, lines 4 and 5, change "1 to 12" to --1, 2, 11 or 12--.

Please add new claim 14 as follows.

--14. (New) A program recording apparatus according to Claim 6 characterized in that said types are determined based on the information included in electronic program information and/or the information inputted by the user.--

Atty. Docket No.:
33216M061

REMARKS

Entry and consideration of this Preliminary Amendment is respectfully requested prior to or concurrent with calculation of the filing fees. This Preliminary Amendment is being filed to correct improper multiple dependencies. As so amended, the claims are submitted as appearing in proper multiple dependent form.

Examination on the merits is awaited.

Respectfully submitted,
SMITH, GAMBRELL & RUSSELL, LLP

Beveridge, DeGrandi, Weilacher & Young
Intellectual Property Group

By: _____

Michael A. Makuch, Reg. No. 32,263
1850 M Street, N.W., Suite 800
Washington, D.C. 20036
Telephone: (202) 659-2811
Fax: (202) 659-1462

November 28, 2000

SPECIFICATION

TITLE OF THE INVENTION

Program Recording Apparatus and Program Recording Medium

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a program recording apparatus.

Related Art of the Invention

First, a structure of a program recording apparatus according to a prior art is described in reference to Fig 18. Here, Fig 18 is a configuration view of a program recording apparatus according to a prior art.

The main tuner 10 is a means for receiving an analog broadcasting channel which becomes a recorded image object from an antenna 1.

A sub-tuner 20 is a means for receiving electronic program information provided by a broadcasting station (not shown) from the antenna 1. A data decoding processing part 21 is a means for inputting a signal from the sub-tuner 20 so as to extract and decode electronic program information which multiplexed between vertical retrace line sections of a particular channel.

An image/speech sound encoding processing part 30 is a part for inputting a signal from the main tuner 10 so as to code

a digital image/speech sound signal by MPEG, or the like.

A micro controller 240 wherein a clock and graphic function are built in is a means which can generate program management information as graphics so as to control the display by a data display part 90 in accordance with the operation of an infrared remote controller 250 by a user. A memory 41 is a means for maintaining work memories required for electronic program information, program management information and the operation of the micro controller 240 wherein a clock and graphics function is built in.

The memory 41 stores electronic program information as shown in Fig 2. Here, Fig 2 is a list of electronic program information (appropriately extracted from electronic program information delivered in the week of July 28, 1999) at 20:30 on August 12, 1999.

Electronic program information provided by a broadcasting station (not shown) is formed of seven items: channel, program title, broadcast date and time, genre, program summary, television personalities and series information. The channel is a broadcasting channel of programs. The program title is the title of a program. Broadcast date and time are the date and time when the program broadcast is started and the date and time when the program broadcast is finished. The genre is the category which reflects the contents of the program and is any of "news," "movies," "sports," "drama," "documentary," and "others." The

program summary is a summary of the program contents, which is able to be omitted. The television personalities are the people who appear on the program, which are able to be omitted. The series information shows broadcast format of a program, or the like, and is information which is attached in the case that the program consists of a series.

In addition, the memory 41 stores program management information as shown in Fig 19. Here, Fig 19 is a list of program management information (recorded programs and programs set for recording are extracted) at 20:30 on August 12, 1999 according to a prior art.

The program management information is formed of seven item of present time, maximum recording time, priority criterion for erasing programs, channel, program group, program group recording criterion and program recording condition (broadcast start date and time and recording time are included).

The present time is current time. The maximum recording time is the maximum value of the total of the program recording time which can be recorded in a recording medium 261. Here the maximum recording time of the recording medium 261 is 12 hours.

The priority criterion for erasing programs is a criterion which is set by a user, which determines the priority with respect to the erasure of data containing the contents of the recorded programs or the programs set for recording and which is the "broadcast starting date and time" (that is to say, the data which

contains the contents of the program of which the broadcast starting date and time is earlier are erased according to priority).

The channel is a broadcasting channel of programs. A program group is a series of series information offered by a broadcasting station (not shown). The program group recording criterion is a criterion with respect to the recording of data which contains the contents of programs which is set for each program group and which enables the selection of either of "record the newest x times (x is substituted by a concrete numeral)" or "record every time" for each program group.

The program recording condition is a condition with respect to program recording and is any of "set for recording," "recorded" or "recording." Here, in the column of the program recording condition the starting date and times of program broadcasting and recording time of a program (noted in parentheses) are also noted. Here, the starting date and time of program broadcast in the present column also represents the program title and is noted, for example, as 1999/0812/21:00 in Fig 20 for the program "Total Solar Eclipse" in Fig 2. In addition, the recording time of a program is the broadcasting time of the program.

The infrared remote controller 250 is a means for commanding the power source control, channel switching, setting for recording a program, and password input of the recording setter to the micro controller 240 wherein a clock and graphics function

are built in through the infrared reception part 51.

The media control part 60 is a part for inputting a signal from the image/speech sound encoding processing part 30 and the micro controller 240 wherein a clock/graphics function are built in so as to carry out writing in and erasing of the data in the recording medium 261.

An image/speech sound decoding processing part 70 is a part for inputting a signal from the medium controlling part 60 so as to decode a digital/image speech sound signal.

An image/speech sound/graphics switching part 80 is a part for inputting a signal from the main tuner 10, the micro controller 240 wherein a clock and graphics function are built in and the image/speech sound decoding processing part 70 so as to switch the outputs of image, speech sound and graphics.

The data display part 90 is a part for inputting a signal from the image/speech sound/graphics switching part 80 so as to render an image and speech sound on a CRT (cathode ray tube) 91.

The operation of the program recording apparatus according to a prior art which has the above described configuration is described in reference to Figs 18 to 20.

First, the operations of the program recording apparatus according to a prior art when receiving electronic program information offered by a broadcasting station (not shown) and when forming program management information are described.

The sub-tuner 20 receives, from the antenna 1, the electric

wave sent out from a broadcasting station (not shown) extracts data which has electronic program information and carries out signal output to the data decoding processing part 21. The data decoding processing part 21 decodes a signal inputted from the sub-tuner 20 and carries out signal output to the micro controller 240 wherein a clock and graphics function are built in. The micro controller 240 wherein a clock and graphics function are built in inputs a signal from the data decoding processing part 21, which is outputted to the memory 41.

The memory 41 inputs a signal from the micro controller 240 wherein a clock and graphics function are built in and stores electronic program information offered by a broadcasting station. The memory 41 stores electronic program information as shown in Fig 2 at 20:30 on August 12, 1999.

In addition, the micro controller 240 wherein a clock and graphics function are built in refers to the electronic program information and forms program management information as shown in Fig 19, which is stored in the memory 41.

Next, the operation of the program recording apparatus according to a prior art when carrying out a setting for recording a program group "Total Solar Eclipse" through the record indication by a user at 20:30 on August 12, 1999 is described.

The infrared remote controller 250 inputs a signal, which commands the recording of the program group "Total Solar Eclipse" according to a record indication by the user, to the micro

controller 240 wherein a clock and graphics function are built in through the infrared reception part 51. Here, the record indication contents by the user are that the channel is "12," the program group is "Total Solar Eclipse" and the program group recording criterion is "record every time."

The micro controller 240 wherein a clock and graphics function are built in inputs a signal of the above described record indication from the infrared remote controller 50. In addition, the micro controller 240 wherein a clock and graphics function are built in refers to electronic program information as shown in Fig 2 based on the input signal and recognizes that the program group "Total Solar Eclipse" comprises a program "Total Solar Eclipse (first)" which is broadcast from 21:00 on August 12, 1999 and of which the recording time is 2 hours, and a program "Total Solar Eclipse (second)" which is broadcast from 21:00 on August 12, 1999 and of which the recording time is 2 hours. The micro controller 240 updates the program management information as shown in Fig 19 to program management information as shown in Fig 20. Here, Fig 20 is a list of updated program management information at 20:30 on August 12, 1999, which is different from Fig 19 in the point that information with respect to the program group "Total Solar Eclipse" is written in.

The micro controller 240 wherein a clock and graphics function are built in stores that updated program management information in the memory 41.

Next, the operation by the program recording apparatus when recording the program "Total Solar Eclipse (first)" at 21:00 on August 12, 1999 is described.

The micro controller 240 wherein a clock and graphics function are built in refers to program management information as shown in Fig 20 when it becomes close to 21:00 on August 12, 1999 and recognizes that sufficient empty space exists in the recording medium 261 for recording the program "Total Solar Eclipse (first)" (noted as 1999/0812/21:00 in Fig 20) of which the recording time is 2 hours because the maximum recording time of the recording medium 261 is 12 hours and the total recording hours of the programs of which the program recording condition is "recorded" is 10 hours at 21:00 on August 12, 1999.

The main tuner 10 receives electric waves sent out from the broadcasting station (not shown) from the antenna 1 when it becomes 21:00 on August 12, 1999, and extracts data which contain the contents of the program "Total Solar Eclipse (first)" so as to carry out signal output to the image/speech sound encoding processing part 30. The image/speech sound encoding processing part 30 encodes a signal inputted from the main tuner 10 and carries out a signal output to the medium control part 60. The medium control part 60 inputs a signal from the image/speech sound encoding processing part 30 and starts the writing in of the data which contains the contents of the program "Total Solar Eclipse (first)" to a recording medium 261. In addition, the medium

control part 60 carries out a signal output, of the start of the writing in of the data which contains the contents of the program "Total Solar Eclipse (first)" to the recording medium 261, into the micro controller 40 wherein a clock and graphics function are built in.

The micro controller 40 wherein a clock and graphics function are built in updates program management information as shown in Fig 21 and stores this in the memory 41. Here, Fig 21 shows a list of program management information at 21:00 on August 12, 1999 which is different from Fig 20 in the point that the program recording condition of the program "Total Solar Eclipse (first)" is "recording."

Next, the operation of the program recording apparatus when carrying out recording of the program "Total Solar Eclipse (second)" at 21:00 on August 13, 1999 is described.

The micro controller 240 wherein a clock and graphics function are built in refers to program management information as shown in Fig 21 when it becomes close to 21:00 on August 13, 1999 and recognizes that sufficient empty space does exist in the recording medium 261 for recording the program "Total Solar Eclipse (second)" (noted as 1999/0813/21:00 in Fig 20) of which the recording time is 2 hours because the maximum recording time of the recording medium 261 is 12 hours and the total recording hours of the programs of which the program recording condition is "recorded" is 12 hours at 21:00 on August 13, 1999.

As shown in Fig 20, the program erasure priority criterion is "broadcast start date and time" according to a prior art. Therefore, the data contains the contents of a program of which the broadcast start date and time is earlier are erased according to the priority.

The program of which the broadcast start date and time is the earliest is the program "It Will be Sunny Tomorrow (sixth)" (noted as 1999/0728/20:00 in Fig 20) and the program of which the broadcast start date and time is the earliest next to this is the program "It Will be Sunny Tomorrow (seventh)" (noted as 1999/0804/20:00 in Fig 20).

The micro controller 240 wherein a clock and graphics function are built in judges that it is enough to erase the data containing the contents of "It Will be Sunny Tomorrow (sixth)" of which the recording time is 1 hour and the data containing the contents of "It Will be Sunny Tomorrow (seventh)" of which the recording time is 1 hour in order to carry out the recording of the program "Total Solar Eclipse (first)" of which the recording time is 2 hours and carries out a signal output of a command to erase these to the medium control part 60.

The medium control part 60 inputs a command from the micro controller 240 wherein a clock and graphics function are built in and erases the data containing the contents of the program "It Will be Sunny Tomorrow (sixth)" and the data containing the contents of the program "It Will be Sunny Tomorrow (seventh)."

The main tuner 10 receives the electric wave sent out from the broadcasting station (not shown) from the antenna 1 at 21:00 on August 12, 1999 and extracts the data containing the contents of the program "Total Solar Eclipse (second)" so as to carry out a signal output to the image/speech sound encoding processing part 30. The image/speech sound encoding processing part 30 encodes a signal inputted from the main tuner 10 and carries out a signal output to the medium control part 60. The medium control part 60 inputs a signal from the image/speech sound encoding processing part 30 and starts the writing in of the data containing the contents of the program "Total Solar Eclipse (second)" to the recording medium 261.

In addition, as has already been described, the program "It Will be Sunny Tomorrow (sixth)" and the program "It Will be Sunny Tomorrow (seventh)" are erased at the time when the program "Total Solar Eclipse (second)" is started to be recorded according to the program erasure priority criterion. In the case that the user strongly desires to watch the program "It Will be Sunny Tomorrow (sixth)" and the program "It Will be Sunny Tomorrow (seventh)," that is to say, these are the programs which must not be erased, it is disadvantageous.

In this manner there is the problem that, when sufficient vacant space does not exist at the time of carrying out recording the programs which are judged to have the highest priority of erasure, according to the program erasure priority criterion,

are erased, even in the case that they are the programs the user does not desire to be erased.

SUMMARY OF THE INVENTION

Taking such a problem into consideration, the purpose of the present invention is to provide a program recording apparatus which is characterized in that the programs which must not be erased can be appropriately stored.

The 1st invention of the present invention is a program recording apparatus comprising:

a program information input means for inputting program information concerning programs;

a program recording setting means for the setting of the recording of programs;

a recording means for writing in, and erasing, data containing the contents of said programs to and from a recording medium; and

a management means for storing program information which is inputted from said program information input means and for recording said programs by said recording means according to said setting for recording or independent of said setting for recording,

wherein the program recording apparatus is characterized in that, at the point in time when said program recording setting means sets the recording of a program, said management means

predicts a shortage of vacant space in said recording medium at the point in time when said recording means carries out the writing in of the data containing the contents of said program, of which the recording is set, to said recording medium by referring to program management information which includes, at least, said program information, the recording status of said recording medium and recording setting status of said programs and in the case that said vacant space is in shortage, decides the programs to be erased at the point in time when said writing in is carried out among the programs which have already been recorded or which have already been set for recording according to a predetermined criteria which includes a criterion concerning the erasure possibility at the point in time when said writing in of the program is carried out.

The 2nd invention of the present invention is a program recording apparatus comprising;

a program information input means for inputting program information concerning programs;

a program recording setting means for setting the recording of programs;

a recording means for writing in and erasing data containing the contents of said programs to and from a recording medium; and

a management means for storing program information inputted from said program information input means and for

recording said programs by said recording medium according to said setting for recording or independent of said setting for recording,

wherein the program recording apparatus is characterized in that at the point in time when a recording indication is given, said management means recognizes a shortage of vacant space in said recording medium by referring to program management information which includes, at least, said program information, recording status of said recording medium and recording setting status of said programs and in the case that said vacant space is in shortage, determines the programs to be erased at the point in time when said writing in is carried out among the programs which have already been recorded and which have already been set for recording according to a predetermined criteria which includes a criterion concerning the erasure possibility at the point in time when said writing in of the program is carried out.

The 3rd invention of the present invention is a program recording apparatus according to either of 1st or 2nd inventions characterized in that said determination of programs to be erased is carried out by utilizing a criterion concerning said program management information and said erasure possibility.

The 4th invention of the present invention is a program recording apparatus according to 3rd invention characterized in that said determination of the programs to be erased is carried out, by utilizing a history of recording operation which is carried

out, by said recording means.

The 5th invention of the present invention is a program recording apparatus according to either of 1st or 2nd inventions characterized in that said determination of the erasure possibility of the programs or said determination of the programs to be erased is carried out by utilizing any of broadcast start date and time, broadcast time, number of viewings and types of said programs which have been recorded or have been set for recording.

The 6th invention of the present invention is a program recording apparatus according to either of 1st or 2nd inventions characterized in that the criterion concerning said erasure possibility in said predetermined criteria is set for each of the types of said programs.

The 7th invention of the present invention is a program recording apparatus according to any of 1st to 6th inventions characterized in that said predetermined criteria can be freely changed.

The 8th invention of the present invention is a program recording apparatus according to any of Claims 1st to 6th inventions characterized in that said program information is electronic program information.

The 9th invention of the present invention is a program recording apparatus according to either of 5th or 6th inventions characterized in that said types are determined based on the

information included in electronic program information and/or the information inputted by the user.

The 10th invention of the present invention is a program recording apparatus according to either of 1st or 2nd inventions characterized in that an indication of cancellation of said setting for recording by the user is necessary in order to cancel the setting for recording of said programs which have been set for recording of which the criterion concerning said erasure possibility is non-erasable.

The 11th invention of the present invention is a program recording apparatus comprising:

a program information input means for inputting program information concerning programs;

a program recording setting means for setting the recording of programs;

a recording means for writing and erasing data containing contents of said programs on a recording medium; and

a management means for storing program information inputted from said program information input means and for recording said programs by said recording means according to said setting for recording and independent of said setting for recording,

wherein said program recording setting means can carry out a comprehensive setting for recording which makes a plurality of pairs of recording/erasing operations; and

in the case that a recording of a program which belongs to a program group comprising programs which have been comprehensively set for recording is carried out, said recording means may carry out the recording by erasing the programs which have, already, been recorded before the recording is carried out and which belong to said program group.

The 12th invention of the present invention is a program recording apparatus according to 11th invention characterized in that in the case that a recording of a program belonging to said program group is carried out, said recording means carries out the recording by erasing the programs belonging to said program group, which have already been recorded before the recording is carried out.

The 13th invention of the present invention is a program recording medium characterized by the recording of programs and/or data in order to make a computer carry out the entire, or part of, the functions of the entire, or part of, the means of the present invention according to any of 1st to 12th inventions, and characterized by being readable by computer.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig 1 is a configuration diagram of a program recording apparatus described in embodiment 1 according to the present invention;

Fig 2 is a list of electronic program information described

in embodiment 1 according to the present invention;

Fig 3 is a list of program management information described in embodiment 1 according to the present invention;

Fig 4 is a list of program management information described in embodiment 1 according to the present invention;

Fig 5 is a list of program management information described in embodiment 1 according to the present invention;

Fig 6 is a list of program management information described in embodiment 1 according to the present invention;

Fig 7 is a display diagram of program management information by each recording setter described in embodiment 1 according to the present invention;

Fig 8 is a display diagram of program management information by each recording setter described in embodiment 1 according to the present invention;

Fig 9 is a configuration diagram of a program recording apparatus described in embodiment 2 according to the present invention;

Fig 10 is a list of program management information described in embodiment 2 according to the present invention;

Fig 11 is a list of program management information described in embodiment 2 according to the present invention;

Fig 12 is a list of program erasure priority management information described in embodiment 2 according to the present invention;

Fig 13 is a list of program erasure priority management information described in embodiment 2 according to the present invention;

Fig 14 is a schematic diagram of a program management list comprising a program management table and a recording medium which is in a bar graph form as described in embodiment 2 according to the present invention;

Fig 15 is a schematic diagram of a program management list comprising a program management table and a recording medium which is in a bar graph form as described in embodiment 2 according to the present invention;

Fig 16 is a schematic diagram of a recording medium which is in a bar graph form as described in embodiment 2 according to the present invention:

Fig 17 is a flow chart which describes the operation of the program recording apparatus described in embodiment 2 according to the present invention;

Fig 18 is a configuration diagram of a program recording apparatus according to a prior art;

Fig 19 is a list of program management information according to a prior art;

Fig 20 is a list of program management information according to a prior art; and

Fig 21 is a list of program management information according to a prior art.

Description of Symbols

1 antenna

10 main tuner

20 sub-tuner

21 data decoding processing part

30 image/speech sound encoding processing part

40 micro controller wherein a clock and graphics function are built in

41 memory

50 infrared remote controller

51 infrared reception part

60 medium control part

61 recording medium

70 image/speech sound decoding processing part

80 image/speech sound/graphics switching part

90 data display part

91 CRT

92 speaker

140 micro controller wherein a clock and graphics function are built in

150 infrared remote controller

161 recording medium

240 micro controller wherein a clock and graphics function are built in

250 infrared remote controller

261 recording medium

PREFERRED EMBODIMENTS OF THE INVENTION

In the following the embodiments according to the present invention are described in reference to the drawings.

(Embodiment 1)

First, the configuration of a program recording apparatus according to the present embodiment 1 is described in reference to Fig 1. Here, Fig 1 is a configuration diagram of a program recording apparatus according to the present embodiment 1.

The main tuner 10 is a means for carrying out a reception of an analog broadcast channel which becomes an object of recording from the antenna 1.

The sub-tuner 20 is a means for carrying out reception of electronic program information offered by a broadcasting station (not shown) from the antenna 1. The data decoding processing part 21 is a means for inputting a signal from the sub-tuner 20 and for carrying out extraction and decoding of electronic program information which is multiplexed between the vertical retrace line sections of a particular channel. Here, the means formed of the sub-tuner 20 and the data decoding processing part 21 according to the present embodiment 1 corresponds to the program information input means of the present invention.

The image/speech sound encoding processing part 30 is a part for inputting a signal from the main tuner 10 so as to carry out the encoding of a digital image/speech sound signal by MPEG, or the like (the image/speech sound encoding processing part 30 is not necessary in the case of reception of digital broadcasting).

The micro controller 40 wherein a clock and graphics function are built in is a means for predicting the shortage of vacant space of the recording medium 61 at the time of carrying out the writing in of the data containing the contents of a program which is set to be recorded by the medium control part 60 at the time when the program is set to be recorded by referring to program management information which includes, at least, program information, recording condition of the recording medium 61 and the setting condition for the recording of the programs. In addition, the micro controller 40 wherein a clock and graphics function are built in is a means for determining, in the case that the vacant space of the recording medium 61 is in the shortage state, the programs to be erased at the time when the writing in is carried out among the programs which have already been recorded or the programs which have already been set for recording according to a predetermined criterion including the criterion concerning the erasure possibility at the time when the writing in of the programs is carried out.

Here, the micro controller 40 wherein a clock and graphics function are built in is a means which can classify programs into

program groups by using electronic program information, information inputted from a infrared remote controller 50 through the record indication by the user and time information. In addition, the micro controller 40 wherein a clock and graphics function are built in is, as described below, a means for generating program management information as a graphic which can control the display by the data display part 90 according to the operation of the infrared remote controller 50 by the user.

The memory 41 is a means for storing electronic program information, program management information and a work memory which is necessary for the operation of the micro controller 40 wherein a clock and graphics function are built in.

Here, a means formed of the micro controller 40 wherein a clock and graphics function are built in and the memory 41 according to the present Embodiment 1 corresponds to the management means according to the present invention.

In addition, the memory 41 stores electronic program information as shown in Fig 2 and program management information as shown in Fig 3. Here, Fig 3 is a list of program management information at 20:30 on August 12, 1999 which is described in the embodiment of the present invention, wherein the maximum recording time of the recording medium 61 is 12 hours and the total recording time of the programs of which the program recording conditions are "recorded" at 20:30 on August 12, 1999 is 10 hours. In addition, the program "Holiday in Los Angeles (Part 26

Informer's Report)" (noted as 1999/0816/21:00 in Fig 3) of which the recording time is 2 hours is set for recording in the vacant space for 2 hours. As described below, though the program recording condition of the program "Holiday in Los Angeles (Part 26 Informer's Report)" is "recording," the erasure possibility criterion of this program group indicates "non-erase" and, therefore, the recording setting for the program "Holiday in Los Angeles (Part 26 Informer's Report)" cannot be cancelled without the indication of cancellation of the setting for recording by the user.

The program management information consists of eleven items which are present time, maximum recording time, program erasure priority criterion, channel, program group, program group recording criterion, erasure possibility criterion of a program group, recording setter, a password, program recording condition (including broadcast start date and time and recording time) and total usage time.

Here, the channel corresponds to a part of program information in the present invention. And, the program group corresponds to a part of the program information in the present invention. In addition, the program recording condition corresponds to a part of the recording condition of the above described recording medium and the above described setting condition for the recording of the programs in the present invention. And, the total usage time corresponds to a part of

the recording condition of the recording medium in the present invention. In addition, the erasure possibility criterion of a program group in the present invention need not be included in the program management information as in the present embodiment 1 but, rather, may be managed separately from the program management information.

The main items which form the program management information are described.

The maximum recording time is the maximum value of the total recording time of the programs that can be recorded in the recording medium 61. Here, the maximum recording time of the recording medium 61 is 12 hours.

The erasure possibility criterion of a program is a criterion, set by the user, for determining the priority of the erasure of the data containing the contents of the programs which have been recorded or set for recording, and the erasure possibility criterion of a program according to the present embodiment 1 is "broadcast start date and time" (that is to say, the data containing the contents of programs of which the broadcast start date and time is earlier are erased according to priority). Here, the erasure possibility criterion of a program according to the present embodiment 1 corresponds to a predetermined criterion of the present invention by being combined with the program group erasure possibility criterion, which is described later.

The channel is a broadcasting channel of a program. The program group is a series in the series information of the electronic program information which is offered by the broadcasting station (not shown). Here, the program group in the present embodiment 1 corresponds to the types of the programs according to the present invention.

The program group recording criterion is a criterion, set for each program group, concerning the recording of the data containing the contents of programs and it is possible to select either "record the newest x times (x is substituted with a concrete numeral)" or "record every time" for each program group.

The erasure possibility criterion of a program group is a criterion, set for each program group, concerning whether or not the data containing the contents of the programs must be erased and is either of "erasable" or "non-erasable." Here, the erasure possibility criterion of a program group in the present Embodiment 1 corresponds to the program group erasure possibility criterion according to the present invention, and is an item which is not included in the program management information according to a prior art.

The recording setter is a registered name of a recording setter which is set by the recording setter and is an item which is not included in the program management information according to a prior art. The password indicates whether or not a personal identification number of the recording setter exists, which is

set by the recording setter and is an item which is not included in the program management information according to a prior art.

The program recording condition is a condition concerning the recording of the programs and is any of "set for recording," "recorded" and "recording." Here, in the column of the program recording condition the broadcast start date and time of the programs and the recording time (noted in parentheses) of the programs are also described. Here, the broadcast start date and time of the programs in this column also represent program titles and, for example, the program "Total Solar Eclipse (first)" in Fig 2 is noted as 1999/0812/21:00 in Fig 4. The total usage time is the total of the recording time of the programs which have been recorded or set for recording in a program group.

The infrared remote controller 50 is a means for commanding the power source control, channel switching, setting for recording a program, password input of the recording setter, or the like, to the micro controller 40 wherein a clock and graphics function are built in through the infrared reception part 51. Here, a means which consists of the infrared remote controller 50 and the infrared reception part 51 in the present embodiment 1 corresponds to a program recording setting means according to the present invention.

The medium control part 60 is a part for inputting a signal from the image/speech sound encoding processing part 30 and the micro controller 40 wherein a clock and graphics function are

built in so as to carry out the writing in and erasure of the data in the recording medium 61. Here, the medium control part 60 in the present embodiment 1 corresponds to a recording means according to the present invention.

The image/speech sound decoding processing part 70 is a part for inputting a signal from the medium control part 60 so as to carry out the decoding of a digital image/speech sound signal.

The image/speech sound/graphics switching part 80 is a part for inputting a signal from the main tuner 10, the micro controller 40 wherein a clock and graphics function are built in and the image/speech sound decoding processing part 70 so as to carry out output switching between image, speech sound and graphics.

The data display part 90 is a part for inputting a signal from the image/speech sound/graphics switching part 80 so as to render image and speech sound on a CRT 91 and a speaker 92.

The operation of a program recording apparatus according to the present embodiment 1 which has such a configuration as the above is described in reference to Figs 1 to 8.

First, reception of electronic program information which is provided by a broadcasting station (not shown) and the operation of carrying out the formation of program management information in the program recording apparatus according to the present embodiment 1 are described. Here, the electronic program

information according to the present embodiment 1 is shown in Fig 2.

The sub-tuner 20 receives electric waves sent out from the broadcasting station (not shown) at the antenna 1 and extracts data which has the electronic program information so as to carry out a signal output to the data decoding processing part 21. The data decoding processing part 21 decodes a signal inputted from the sub-tuner 20 and carries out a signal output to the micro controller 40 wherein a clock and graphics function are built in. The micro controller 40 wherein a clock and graphics function are built in inputs a signal from the data decoding processing part 21 and outputs this to the memory 41.

The memory 41 inputs a signal from the micro controller 40 wherein a clock and graphics function are built in and stores the electronic program information as shown in Fig 2.

In addition, the micro controller 40 wherein a clock and graphics function are built in refers to the electronic program information, the recording condition of the recording medium 61 and the condition of the programs set for recording and forms the program management information as shown in Fig 3 so as to output this into the memory 41.

The memory 41 inputs a signal of the program management information from micro controller 40 wherein a clock and graphics function are built in, which is stored.

Next, the operation of the program recording apparatus

according to the present embodiment 1 when carrying out the recording setting of the program group "Total Solar Eclipse" according to the record indication by the recording setter A at 20:30 on August 12, 1999 is described in detail.

The infrared remote controller 50 inputs a signal which commands the recording of the program group "Total Solar Eclipse" according to the record indication by the recording setter A into the micro controller 40 wherein a clock and graphics function are built in through the infrared reception part 51. Here, the contents of the record indication by the recording setter A are that the channel is "12," the program group is "Total Solar Eclipse," the program group recording criterion is "record every time," the program group erasure possibility criterion is "non-erasable," the recording setter is "A" and the password is "nil."

The micro controller 40 wherein a clock and graphics function are built in inputs a signal of the above described record indication from the infrared remote controller 50.

The micro controller 40 wherein a clock and graphics function are built in refers to the electronic program information as shown in Fig 2 based on the input signal and recognizes that the program group "Total Solar Eclipse" consists of a program "Total Solar Eclipse (first)" which is broadcast from 21:00 on August 12, 1999 and of which the recording time is 2 hours and a program "Total Solar Eclipse (second)" which is broadcast from

21:00 on August 13, 1999 and of which the recording time is 2 hours and then refers to the program management information as shown in Fig 3 so as to make judgments as follows.

The micro controller 40 wherein a clock and graphics function are built in recognizes that sufficient vacant space exists in the recording medium 61 at the time when the writing in of the data containing the contents of the program "Total Solar Eclipse (first)" of which the recording time is 2 hours is carried out (that is to say, at 21:00 on August 12, 1999), because the maximum recording time of the recording medium 61 is 12 hours and the total recording time of the programs of which the program recording conditions are "recorded" at 21:00 on August 12, 1999 is 10 hours. Accordingly, the micro controller 40 wherein a clock and graphics function are built in judges that the data containing the contents of the program "Total Solar Eclipse (first)" may be written in in the vacant space for 2 hours.

The micro controller 40 wherein a clock and graphics function are built in recognizes that sufficient vacant space does not exist in the recording medium 61 at the time when the writing in of the data containing the contents of the program "Total Solar Eclipse (second)" of which the recording time is 2 hours is carried out (that is to say, at 21:00 on August 13, 1999), because the maximum recording time of the recording medium 61 is 12 hours and the total recording time of the programs of which the program recording conditions are "recorded" at 21:00

on August 13, 1999 is 12 hours. Accordingly, the micro controller 40 wherein a clock and graphics function are built in judges that the data containing the contents of the program which has been recorded at 21:00 on August 13, 1999 must be erased in order to carry out the recording of the program "Total Solar Eclipse (second)" according to the record indication by the recording setter A.

As described above the program erasure priority criterion in the present embodiment 1 is a "broadcast start date and time." Accordingly, among the data of which the program group erasure possibility criterion is "erasable" the data containing the program contents of which the broadcast start date and time is the earliest is erased according to the priority.

The program of which the broadcast start date and time is the earliest is the program "It Will be Sunny Tomorrow (sixth)" (which is noted as 1999/0728/20:00 in Fig 3) and the program of which the broadcast start date and time is the earliest next to this is the program "It Will be Sunny Tomorrow (seventh)" (which is noted as 1999/0804/20:00 in Fig 3). However, both of those programs belong to the program group "It Will be Sunny Tomorrow" and the program group erasure possibility criterion which is set for the program group "It Will be Sunny Tomorrow" is "non-erasable."

The program of which the broadcast start date and time is the third earliest is the program "Holiday in Los Angeles (Part

25 Secret)" (which is noted as 1999/0809/21:00 in Fig 3). However, this program belongs to the program group "Holiday in Los Angeles" and the program group erasure possibility criterion which is set for the program group "Holiday in Los Angeles" is "non-erasable."

The micro controller 40 wherein a clock and graphics function are built in judges that the program "Professional Baseball A vs. B (the eighth game)" (which is noted as 1999/0810/18:00 in Fig 3) of which the recording time is 3 hours must be erased and the data containing the contents of the program "Total Solar Eclipse (second)" of which the recording time is 2 hours may be written in in a part of the vacant space, which is generated by the erasure of the above program, for 3 hours.

The micro controller 40 wherein a clock and graphics function are built in recognizes that sufficient vacant space does not exist in the recording medium 61 at the time when the writing in of the data containing the contents of the program "Holiday in Los Angeles (Part 26 Informer's Report)" (which is noted as 1999/0816/21:00 in Fig 3), of which the recording time is 2 hours, into the recording medium 61 is carried out (that is to say, at 21:00 on August 16, 1999), because the maximum recording time of the recording medium 61 is 12 hours and the total recording time of the programs of which the program recording conditions are "recorded" at 21:00 on August 16, 1999 is 11 hours.

The micro controller 40 wherein a clock and graphics function are built in judges that the program "News Seven (August

11)" (which is noted as 1999/0811/07:00 in Fig 3) of which the recording time is 1 hour must be erased at 21:00 on August 16, 1999 and the data containing the contents of the program "Holiday in Los Angeles (Part 26 Informer's Report)" of which the recording time is 2 hours may be written in in the vacant space for 2 hours in total, 1 hour of which is generated by the erasure of the above program and 1 hour of which previously existed without carrying out erasure.

The micro controller 40 wherein a clock and graphics function are built in accepts the recording of the program group "Total Solar Eclipse" based on the above described judgment as the record indication by the recording setter A and updates the program management information as shown in Fig 3 into the program management information as shown in Fig 4. Here, Fig 4 is a list of updated program management information at 20:30 on August 12, 1999 which is described in the embodiments of the present invention, which is different from Fig 3 in the point that information concerning the program group "Total Solar Eclipse," is written in. Here, the program "Professional Baseball A vs. B (the eighth game)" (which is noted as 1999/0810/18:00 in Fig 4) and the program "News Seven (August 11)" (which is noted as 1999/0811/07:00 in Fig 4) which are the programs intended to be erased have × marks attached.

The micro controller 40 wherein a clock and graphics function are built in stores the updated program management

information in the memory 41. And the micro controller 40 wherein a clock and graphics function are built in commands the speaker 92 to output the speech sound display "setting for recording is complete."

The speaker 92 inputs the command from the micro controller 40 wherein a clock and graphics function are built in and outputs the speech sound display "setting for recording is complete."

Next, the operation of the program recording apparatus in the present embodiment 1 when carrying out the selection change of the programs intended to be erased according to the manual operation by the recording setter A at 20:40 on August 12, 1999 is described in detail.

The infrared remote controller 50 outputs a signal of a command to display the management information as shown in Fig 7 on the CRT 91 through the infrared reception part 51 according to the indication by the recording setter A. Here, Fig 7 is a display diagram of the program management information which is simplified for each recording setter at 20:40 on August 12, 1999 which is described in the embodiments of the present invention (here the program management information concerning the program group "Professional Baseball A vs. B," for which a password has been set, is not displayed without inputting a password of the recording setter A).

The infrared remote controller 50 follows the indication by the recording setter A and designates the program "News Seven

(August 12)" (which is noted as 1999/0812/07:00 inFig 7) instead of the program "News Seven (August 11)" (which is noted as 1999/0811/07:00 in Fig 7) as a program which is erased at 21:00 on August 16, 1999 in order to record the program "Holiday in Los Angeles (Part 26 Informer's Report)."

The micro controller 40 wherein a clock and graphics function are built in judges that it is sufficient for the program "News Seven (August 12)" (which is noted as 1999/0812/07:00 in Fig 7) of which the recording time is 1 hour to be designated instead of the program "News Seven (August 11)" (which is noted as 1999/0811/07:00 in Fig 7) of which the recording time is 1 hour as a program which is erased for recording the program "Holiday in Los Angeles (Part 26 Informer's Report)."

The micro controller 40 wherein a clock and graphics function are built in updates the program management information simplified for each recording setter as shown in Fig 7 into the program management information simplified for each recording setter as shown in Fig 8. Here, Fig 8 this display of the program management information simplified for each recording setter at 20:41 on August 12, 1999 which is described in the present embodiment 1. In addition, the micro controller 40 wherein a clock and graphics function are built in updates the program management information as shown in Fig 4 into the program management information as shown in Fig 5. Here, Fig 5 is a display of the program management information at 20:41 on August 12, 1999

which is described in the present embodiment 1 wherein the program "News Seven (August 12)" (which is noted as 1999/0812/07:00 in Fig 7) is designated instead of the program "News Seven (August 11)" (which is noted as 1999/0811/07:00 in Fig 7) as a program which is erased for recording the program "Holiday in Los Angeles (Part 26 Informer's Report)."

The micro controller 40 wherein a clock and graphics function are built in stores the updated program management information in the memory 41. In addition, the micro controller 40 wherein a clock and graphics function are built in commands the speaker 92 to output the speech sound display "update of the setting for recording is complete."

The speaker 92 inputs the command from the micro controller 40 wherein a clock and graphics function are built in and outputs the speech sound display "update of the setting for recording is complete."

Next, the operation of the program recording apparatus in the present embodiment 1 when carrying out recording of the program "Total Solar Eclipse (second)" at 21:00 on August 13, 1999.

The micro controller 40 wherein a clock and graphics function are built in refers to the program management information (not shown) at 21:00 on August 13, 1999 when that time approaches and outputs a command signal, to the medium control part 60, to erase the data containing the contents of the program

"Professional Baseball A vs. B (the eighth game)" (which is noted as 1999/0810/18:00 in Fig 5 for example).

The medium control part 60 inputs the command from the micro controller 40 wherein a clock and graphics function are built in and erases the data containing the contents of the program "Professional Baseball A vs. B (the eighth game)."

The main tuner 10 receives the electric wave sent out from the broadcasting station (not shown) when it becomes 21:00 on August 12, 1999 at the antenna 1 and extracts the data containing the contents of the program "Total Solar Eclipse (second)" so as to carry out a signal output to the image/speech sound encoding processing part 30.

The image/speech sound encoding processing part 30 encodes the signal inputted from the main tuner 10 and carries out a signal output to the medium control part 60.

The medium control part 60 inputs a signal from the image/speech sound encoding processing part 30 and starts the writing in of the data containing the contents of the program "Total Solar Eclipse (second)" to the recording medium 61. In addition, the medium control part 60 outputs, to the micro controller 40 wherein a clock and graphics function are built in, a signal for starting the writing in of the data containing the contents of the program "Total Solar Eclipse (second)" to the recording medium 61.

The micro controller 40 wherein a clock and graphics

function are built in updates the program management information as shown in Fig 6, and stores this in the memory 41. Here, Fig 6 is a list of the program management information at 21:00 on August 13, 1999 which is described in the present embodiments wherein the program recording condition of the program "Total Solar Eclipse (first)" is already "recorded" while the program recording condition of the program "Total Solar Eclipse (second)" is "recording." In addition, the data containing the contents of the program "Professional Baseball A vs. B (the eighth game)" has been erased.

Here, though the program group recording criterion, the program group erasure possibility criterion, the recording setter and the password in the present embodiment 1 have not been changed after being set as in the above described embodiments, they may be arbitrarily changed at any time without limiting the invention to the above.

In addition, in the case that the recording medium of the present invention carries out the recording of a program, which belongs to a program group consisting of the programs which are comprehensively set for recording, the recording may be carried out by erasing the programs which have already been recorded prior to carrying out this recording and which belong to the program group. For example, under the same circumstances as in the above described embodiment 1, there may occur a case wherein the comprehensive setting for the recording of the program group

"Total Solar Eclipse" is carried out by erasing the recording of the program "Total Solar Eclipse (first)" in order to carry out the recording of the program "Total Solar Eclipse (second)." In this case the recording of the program "Total Solar Eclipse (second)," of which the broadcast starts at 21:00 on August 13, 1999, is carried out by erasing the program "Total Solar Eclipse (first)" and, therefore, the erasure of the program "Professional Baseball A vs. B (the eighth game)" is not carried out at this point in time. Here, when the recording of the program "Total Solar Eclipse (second)" is complete the vacant space of the recording medium 61 is eliminated. Accordingly, in order to carry out the recording of the program "Holiday in Los Angeles (Part 26 Informer's Report)," of which the broadcast starts at 21:00 on August 16, 1999, the erasure of the program "Professional Baseball A vs. B (the eighth game)" is carried out. Here, the recording time of the program "Holiday in Los Angeles (Part 26 Informer's Report)" is 2 hours while the recording time of the program "Professional Baseball A vs. B (the eighth game)" is 3 hours and, therefore, when the recording of the program "Holiday in Los Angeles (Part 26 Informer's Report)" is complete the vacant space of 1 hour is created in the recording medium 61. In addition, in this case, the erasure of the program "News Seven (August 12)" is not carried out.

In this way, the program which in non-erasable can be appropriately stored.

(Embodiment 2)

At first the configuration of a program recording apparatus according to the present embodiment 2 is described in reference to Fig 9. Here, Fig 9 is a configuration view of the program recording apparatus in the present embodiment 2.

The micro controller 140 wherein a clock and graphics function are built in is a means to predict, at a point in time when a program is set for recording, the shortage of the vacant space in the recording medium 161 at the time when the medium control part 60 carries out the writing in, of the data containing the contents of the program which has been set to be recorded, to the recording medium 161 by referring to, at least, the program group information, the recording condition of the recording medium 161 and the program management information which includes the setting condition for the recording of the programs. In addition, the micro controller 140 wherein a clock and graphics function are built in is a means for determining the programs which should be erased at the point in time of carrying out the recording among the programs which have already been recorded and which have already been set for recording according to a predetermined criterion including a criterion concerning erasure possibility at the point in time of the carrying out of the above described writing in of the program in the case that the vacant space of the recording medium 161 runs short.

Here, the micro controller 140 wherein a clock and graphics

function are built in is a means which can produce the program management information as a graphic as described below and which can control the display through the data display part 90 according to the operation of the infrared remote controller 150 by the user. Here, the means formed of the micro controller 140 wherein a clock and graphics function are built in and the memory 41 in the present embodiment 2 correspond to the management means of the present invention.

The memory 41 stores the electronic program information (not shown) provided by the broadcasting station and the program management information as shown in Fig 10 at 10:00 on April 9, 1997.

The program management information is formed of seven items: present time, maximum recording capacity, program title and channel, program recording capacity (that is to say, size of the data containing the contents of a program), broadcast start date and time, number of playbacks/dubbings and erasure possibility. Here, the erasure possibility in the present embodiment 2 is either of "erasable" or "non-erasable" based on the indication by the user and this corresponds to the criterion concerning the erasure possibility of the present invention. In addition, the program recording capacity in the present embodiment 2 corresponds to the recording condition of the recording medium and the setting condition for the recording of the programs, of the present invention. In addition, the program

title, channel and broadcast start date and time correspond to part of the program information in the present invention.

In addition, the program management information contains the already recorded capacity, vacant capacity, re-writable capacity, non-erasable capacity, capacity set for recording and capacity which is able to be set for recording. The already recorded capacity is the total sum of the capacity which already contains recorded programs. The vacant capacity is the difference between the maximum recording capacity and the already recorded capacity. The re-writable capacity is the total of the capacity of the recorded programs wherein the erasure possibility is "erasable." The non-erasable capacity is the sum of the capacity of the recorded programs wherein the erasure possibility is "non-erasable." The capacity which is set for recording is the sum of the capacity of the programs which are set for recording. The capacity which is able to be set for recording is the difference between the re-writable capacity and the capacity which is set for recording.

In addition, the memory 41 stores program erasure priority management information as shown in Fig 12 at 10:00 on April 9, 1997.

The program erasure priority management information is formed of seven items: present time, maximum recording capacity, program erasure priority criterion (formed of the two items of playback number and broadcast start date and time), program title,

program recording capacity, erasure priority and erasure plan.

The program erasure priority criterion is the combination of the playback number and the broadcast start date and time. That is to say, the programs are categorized into any of the groups: "playback once," "playback twice or more," "no playback" and "set for recording" according to the playback number and the recording condition while the erasure priority becomes higher in the order of "playback one," "playback twice or more," "no playback" and "set for recording. In addition, within the same group the earlier the broadcast start date and time the higher the erasure priority given to the program. Here, no erasure priority is given to a program of which the above described user indication of erasure possibility is "non-erasable." Accordingly, though the problem "Baseball ab vs. cd 12" is categorized in the group "set for recording," the setting for the recording of the program "Baseball ab vs. cd 12" is not cancelled without the indication of cancellation of the setting for the recording by the user since the indication of the erasure possibility is set as "non-erasable."

Here, the program erasure priority criterion in the present embodiment 2 corresponds to a predetermined criterion of the present invention by being combined with the above described indication of the erasure possibility by the user.

The infrared remote controller 150 is a means for commanding the setting for the recording of the programs, replay

or dubbing of the programs, or the like, to the micro controller 140 wherein a clock and graphics function are built in through the infrared reception part 51. Here, the means formed of the infrared remote controller 150 and the infrared reception part 51 according to the present embodiment 2 corresponds to the program recording setting means of the present invention.

The medium control part 60 is a part which inputs a signal from the image/speech sound encoding processing part 30 and the micro controller 40 wherein a clock and graphics function are built in and carries out the writing in and the erasure of the data in the recording medium 161 of which the maximum recording capacity is 8.5 GB. Here, the medium control part 60 according to the present embodiment 2 corresponds to the recording means of the present invention.

The data display part 90 is a part which inputs a signal from the image/speech sound decoding processing part 70 and renders the image and the speech sound on the CRT 91 and the speaker 92.

The operation of the program recording apparatus according to the present embodiment 2 which has such a configuration as in the above is described in reference to Figs 9 to 17.

The operation of the program recording apparatus in the present embodiment 2 when carrying out the setting for recording the program "Baseball ab vs. cd 13" at 10:00 on April 10, 1997 is described in detail in reference to Fig 17. Here, Fig 17 is

a flow chart for describing the operation of the program recording apparatus according to the present embodiment 2 when carrying out the setting for recording.

The infrared remote controller 150 inputs a command signal to record the program "Baseball ab vs. cd 13" to the micro controller 140 wherein a clock and graphics function are built in through the infrared reception part 51 according to the recording indication by the user. Here, the contents of the recording indication by the recording setter A are as follows: the channel is "6," the program title is "Baseball ab vs. cd 13" and the erasure possibility is "non-erasable."

The micro controller 140 wherein a clock and graphics function are built in inputs a signal of the above described recording indication from the infrared remote controller 150 (S1).

The micro controller 140 wherein a clock and graphics function are built in refers to the above described electronic program information and recognizes that the program "Baseball ab vs. cd 13" is a program which is broadcast from 18:00 on April 12, 1997 and the program recording capacity is 1.5GB. In addition, the micro controller 140 wherein a clock and graphics function are built in refers to the program management information as shown in Fig 10 and recognizes that sufficient vacant space does not exist in the recording medium 161 at the point in time (that is to say, at 18:00 on April 12, 1997) of the carrying out of the

writing in, to the recording medium 161, of the data containing the contents of the program "Baseball ab vs. cd 13." Because the maximum recording capacity of the recording medium 161 is 8.5GB and the sum of the program recording capacity of the programs which have been recorded at 18:00 on April 12, 1997 is 8.5GB and, therefore, it cannot be said that sufficient vacant space does not exist for recording the program "Baseball ab vs. cd 13" of which the program recording capacity is 1.5GB (S2, S3).

The micro controller 140 wherein a clock and graphics function are built in refers to the program erasure priority management information as shown in Fig 12 and judges that the program "News CDF" of which the program recording capacity is 1GB and the program "English Conversation 3" of which the program recording capacity is 0.5GB are erased at 18:00 on April 12, 1997 so that the recording of the program "Baseball ab vs. cd 13" of which the program recording capacity is 1.5GB may be carried out (S4, S5).

The micro controller 40 wherein a clock and graphics function are built in outputs a command signal to display the program management list as shown in Fig 14 on the CRT 91 to the data display part 90 through the image/speech sound graphics switching part 80 in order to notify this judgment to user. Here, Fig 14 is a schematic diagram of the program management table which is described in the present embodiment 2 and of the program management list comprising the recording medium 161 which is made

into a bar graph so that the usage condition can be easily be seen.

Here, the program management table consists of seven items: present time, broadcast start date and time, program title, program recording capacity, erasure priority (including indication of a program for which "non-erasable" is designated), erasure plan and check box for manual setting of erasure/recording release. In addition, in the lower part of the program management table, a button which has a "return" symbol to call back the immediately preceding screen and a button which has a "release" symbol for confirming the manual erasure/recording release through the GUI utilization are displayed.

The data display part 90 inputs a signal from the micro controller 40 wherein a clock and graphics function are built in and displays a program management table as shown in Fig 14 on the screen of the CRT 91 (S6).

The infrared remote controller 150 designates a program "Drama XYZ" as a program which is to be erased at 18:00 on August 12, 1997 according to the indication of the user. In addition, the infrared remote controller 150 changes the condition of erasure possibility of the program "English Conversation 3" from "erasable" to "non-erasable" according to the indication of the user (S7).

The micro controller 140 wherein a clock and graphics function are built in inputs a signal from the infrared remote

controller 150 and updates the program management list as shown in Fig 14 to a program management list as shown in Fig 15 (S8). Here, Fig 15 is a schematic diagram of a program management list which comprises the updated program management table and a recording medium 161 which is shown in bar graph form so that the utilization conditions can be easily seen.

The micro controller 140 wherein a clock and graphics function are built in judges that it is sufficient for the program "News CDF," of which the program recording capacity is 1GB, and the program "Drama XYZ," of which the program recording capacity is 1GB, to be erased at the point in time when the writing in of the data containing the contents of the program "Baseball ab vs. cd 13" of which the program recording capacity is 1.5GB to the recording medium 161 is carried out (S2, S3, S4, S5, S6, S7).

The micro controller 140 wherein a clock and graphics function are built in accepts the recording of the program "Baseball Game ab vs. cd 13" as the recording indication of the user based on the above described judgment and updates the program management information as shown in Fig 10 to the program management information as shown in Fig 11. Here, Fig 11 is a display diagram of the program management information at 10:10 on April 9, 1997 which is described in the embodiment of the present invention. In addition, the micro controller 40 wherein a clock and graphics function are built in updates the program erasure priority management information as shown in Fig 12 to the program erasure

priority management information as shown in Fig 13. Here, Fig 13 is a display diagram of the program erasure priority management information at 10:10 on April 9, 1997 which is described in the embodiment of the present invention.

The micro controller 40 wherein a clock and graphics function are built in stores the program management information as shown in Fig 11 and the program erasure priority management information as shown in Fig 13 in the memory 41. And, the micro controller 40 wherein a clock and graphics function are built in commands the output of the speech sound indication "setting for recording is complete" to the speaker 92.

The speaker 92 inputs the command from the micro controller 40 wherein a clock and graphics function are built in and outputs the speech sound indication "setting for recording is complete."

Here, a considerable display area of the screen is necessary for displaying the program management table as shown in Fig 15 and, therefore, only the display of the recording medium 161 which is shown in a bar graph form may be carried out as shown in Fig 16 in accordance with the wish of the user. In addition, the recording capacity of the recording medium 161 which is in a bar graph form may be displayed by assumption value of the utilization time (for example, 1.5 hours in high quality screen mode). Here, Fig 16 is a schematic diagram of the recording medium 161 as shown in a bar graph form so that the utilization conditions, which are described in the present embodiment 2, can be easily

viewed.

In this way, a management method such as storage and erasure of the data can be appropriately displayed.

Here, the program management information in the present invention is not necessarily formed of channel, program group, program group recording criterion, program group erasure possibility criterion, recording setter, password, program recording conditions and recording time but, rather, for example, information which depends on the contents of the data may be added to this and, in short, it may be the information for managing the programs.

In addition, the types of programs of the present invention need not be a program group based on series information which is offered by the broadcasting station as in the above described embodiment 1 but, rather, may be genres of the programs customized by the user and, in short, may be a concept for properly categorizing the programs. For example, the types of programs of the present invention may be determined based on content titles included in the electronic program information of the image/speech sound contents and the category which is the attribute information of the contents, names of television personalities, content of series information which are broadcast in sequence, summary of the contents and key words which are included therein, or the like, or may be determined based on the original identification information, irrespective of electronic

program information ,which is inputted by the user when carrying out the recording or setting for recording.

In addition, the program management information according to the present invention need not be formed of present time, maximum recording capacity, program title and channel, program recording capacity (that is to say, the size of the data which containing the contents of the program), broadcast start date and time, number of playbacks/dubbings and erasure possibility as in the above described embodiment 2 but, rather, for example, information which depend on the contents of the data may be added to this and, in short, it may be the information for managing the programs.

In addition, the program information according to the present invention need not be electronic program guide information offered by the broadcasting station through electric wave delivery as in the above described embodiments 1 and 2 but, rather, may be program guide information, offered by the recording medium which is attached to, for example, publications and, in short, may be information with respect to the programs for forming the program management information.

In addition, the setting for recording the programs according to the present invention need not be accepted as the recording indication, as in the above described embodiments 1 and 2 but, rather, may be rejected in the case that it is impossible to carry out recording as the recording indication at the point

in time when the recording indication is carried out.

In addition, the criterion with respect to the erasure possibility according to the present invention need not be set for each program type as in the above described embodiments 1 and 2 but, rather, may be set individually for each program.

In addition, the criterion with respect to the erasure possibility according to the present invention need not be constant regardless of the elapse of time as in the above described embodiments 1 and 2 but, rather, may vary according to the elapse of time such that it is non-erasable for only a preset period and becomes erasable after the period has elapsed.

In addition, the recording of the program according to the present invention need not be started according to the setting for the recording which is carried out by the user in advance as in the above described embodiments 1 and 2 but, rather, may be started immediately by the recording indication of the user.

In addition, the function of each component of the program recording apparatus of the present invention may be implemented with the dedicated hardware and may be implemented with software through the program of the computer.

In addition, the entire, or part of, the function of the entire, or part of, the means of each of the above described embodiments may be implemented as an operation of the computer which uses a program recorded medium such as an optical disk or an optical magnetic disk characterized by recording program

and/or data for implementing the above function by computer so that the read-out program and/or data work cooperatively with the computer to implement the function.

As is clear from the above description the aspect of the present invention corresponding to Claim 1 can provide a program recording apparatus characterized by the appropriate management of the storage, erasure, or the like, of the data.

The second aspect of the present invention corresponding to Claim 2 can provide a program recording apparatus characterized by the management of the storage, erasure, or the like, of the data.

The third aspect of the present invention corresponding to Claim 3 can provide a program recording apparatus characterized by, in addition to the above described effects, the failproof management of data.

The fourth aspect of the present invention corresponding to Claim 4 can provide a program recording apparatus characterized by, in addition to the above described effects, the detailed management of data.

The fifth aspect of the present invention corresponding to Claim 5 can provide a program recording apparatus characterized by, in addition to the above described effects, the practical management of data.

The sixth aspect of the present invention corresponding to Claim 6 can provide a program recording apparatus characterized

by, in addition to the above described effects, the even more practical management of data.

The seventh aspect of the present invention corresponding to Claim 7 can provide a program recording apparatus characterized by, in addition to the above described effects, the flexible management of data.

The eighth aspect of the present invention corresponding to Claim 8 can provide a program recording apparatus characterized by, in addition to the above described effects, the simplified management of data.

The ninth aspect of the present invention corresponding to Claim 9 can provide a program recording apparatus characterized by, in addition to the above described effects, the practical management of data.

The tenth aspect of the present invention corresponding to Claim 10 can provide a program recording apparatus characterized by, in addition to the above described effects, the failproof storage of data.

The eleventh aspect of the present invention corresponding to Claim 11 can provide a program recording apparatus characterized by the appropriate management of storage, erasure, or the like, of data.

The twelfth aspect of the present invention corresponding to Claim 12 can provide a program recording apparatus characterized by, in addition to the above described effects,

the practical storage of data.

The thirteenth aspect of the present invention corresponding to Claim 13 can provide a program recording medium characterized by the appropriate management of storage, erasure, or the like, of data for each type of program.

What is Claimed is:

1. A program recording apparatus comprising:

a program information input means for inputting program information concerning programs;

a program recording setting means for the setting of the recording of programs;

a recording means for writing in, and erasing, data containing the contents of said programs to and from a recording medium; and

a management means for storing program information which is inputted from said program information input means and for recording said programs by said recording means according to said setting for recording or independent of said setting for recording,

wherein the program recording apparatus is characterized in that, at the point in time when said program recording setting means sets the recording of a program, said management means predicts a shortage of vacant space in said recording medium at the point in time when said recording means carries out the writing in of the data containing the contents of said program, of which the recording is set, to said recording medium by referring to program management information which includes, at least, said program information, the recording status of said recording medium and recording setting status of said programs and in the case that said vacant space is in shortage, decides the programs

to be erased at the point in time when said writing in is carried out among the programs which have already been recorded or which have already been set for recording according to a predetermined criteria which includes a criterion concerning the erasure possibility at the point in time when said writing in of the program is carried out.

2. A program recording apparatus comprising;

a program information input means for inputting program information concerning programs;

a program recording setting means for setting the recording of programs;

a recording means for writing in and erasing data containing the contents of said programs to and from a recording medium; and

a management means for storing program information inputted from said program information input means and for recording said programs by said recording medium according to said setting for recording or independent of said setting for recording,

wherein the program recording apparatus is characterized in that at the point in time when a recording indication is given, said management means recognizes a shortage of vacant space in said recording medium by referring to program management information which includes, at least, said program information, recording status of said recording medium and recording setting

status of said programs and in the case that said vacant space is in shortage, determines the programs to be erased at the point in time when said writing in is carried out among the programs which have already been recorded and which have already been set for recording according to a predetermined criteria which includes a criterion concerning the erasure possibility at the point in time when said writing in of the program is carried out.

3. A program recording apparatus according to either of Claims 1 or 2 characterized in that said determination of programs to be erased is carried out by utilizing a criterion concerning said program management information and said erasure possibility.

4. A program recording apparatus according to Claim 3 characterized in that said determination of the programs to be erased is carried out, by utilizing a history of recording operation which is carried out, by said recording means.

5. A program recording apparatus according to either of Claims 1 or 2 characterized in that said determination of the erasure possibility of the programs or said determination of the programs to be erased is carried out by utilizing any of broadcast start date and time, broadcast time, number of viewings and types of said programs which have been recorded or have been set for recording.

6. A program recording apparatus according to either of Claims 1 or 2 characterized in that the criterion concerning said erasure possibility in said predetermined criteria is set for

each of the types of said programs.

7. A program recording apparatus according to any of Claims 1 to 6 characterized in that said predetermined criteria can be freely changed.

8. A program recording apparatus according to any of Claims 1 to 6 characterized in that said program information is electronic program information.

9. A program recording apparatus according to either of Claims 5 or 6 characterized in that said types are determined based on the information included in electronic program information and/or the information inputted by the user.

10. A program recording apparatus according to either of Claims 1 or 2 characterized in that an indication of cancellation of said setting for recording by the user is necessary in order to cancel the setting for recording of said programs which have been set for recording of which the criterion concerning said erasure possibility is non-erasable.

11. A program recording apparatus comprising:

a program information input means for inputting program information concerning programs;

a program recording setting means for setting the recording of programs;

a recording means for writing and erasing data containing contents of said programs on a recording medium; and

a management means for storing program information

inputted from said program information input means and for recording said programs by said recording means according to said setting for recording and independent of said setting for recording,

wherein said program recording setting means can carry out a comprehensive setting for recording which makes a plurality of pairs of recording/erasing operations; and

in the case that a recording of a program which belongs to a program group comprising programs which have been comprehensively set for recording is carried out, said recording means may carry out the recording by erasing the programs which have, already, been recorded before the recording is carried out and which belong to said program group.

12. A program recording apparatus according to Claim 11 characterized in that in the case that a recording of a program belonging to said program group is carried out, said recording means carries out the recording by erasing the programs belonging to said program group, which have already been recorded before the recording is carried out.

13. A program recording medium characterized by the recording of programs and/or data in order to make a computer carry out the entire, or part of, the functions of the entire, or part of, the means of the present invention according to any of Claims 1 to 12, and characterized by being readable by computer.

ABSTRACT OF THE DISCLOSURE

A program recording apparatus has

a program information input means for inputting program information concerning programs;

a program recording setting means for the setting of the recording of programs;

a recording means for writing in, and erasing, data containing the contents of the programs to and from a recording medium; and

a management means for storing program information which is inputted from the program information input means and for recording the programs by the recording means according to the setting for recording or independent of the setting for recording,

wherein the program recording apparatus is characterized in that, at the point in time when the program recording setting means sets the recording of a program, the management means predicts a shortage of vacant space in the recording medium at the point in time when the recording means carries out the writing in of the data containing the contents of the program, of which the recording is set, to the recording medium by referring to program management information which includes, at least, the program information, the recording status of the recording medium and recording setting status of the programs and in the case that the vacant space is in shortage, decides the programs to be erased at the point in time when the writing in is carried out among

the programs which have already been recorded or which have already been set for recording according to a predetermined criteria which includes a criterion concerning the erasure possibility at the point in time when the writing in of the program is carried out.

Fig. 1

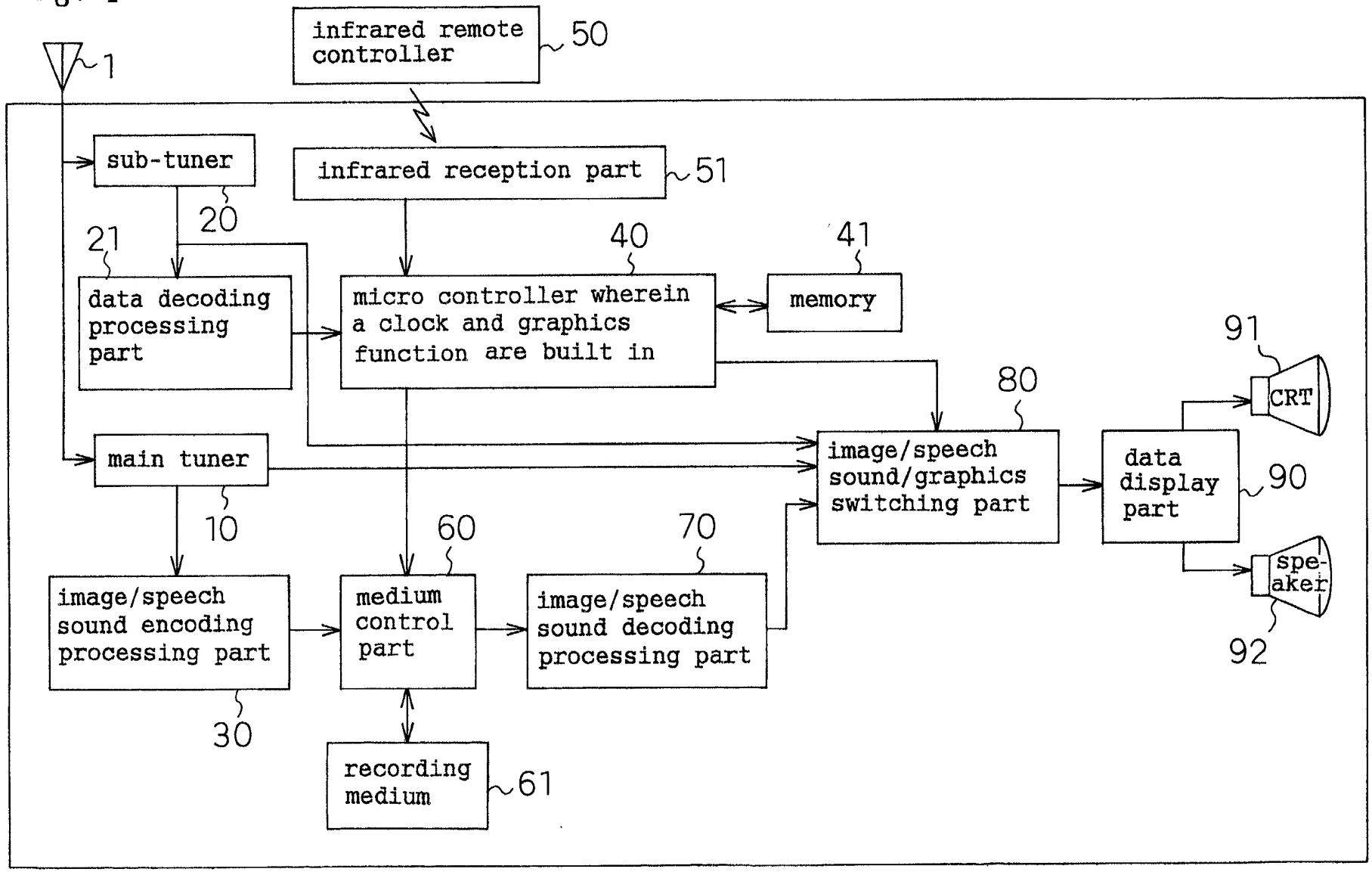

infrared remote controller
50
1
sub-tuner
infrared reception part
51
20
21
40
41
data decoding processing part
micro controller wherein a clock and graphics function are built in
memory
91
CRT
80
main tuner
image/speech sound/graphics switching part
data display part
90
10
60
70
image/speech sound encoding processing part
medium control part
image/speech sound decoding processing part
spe-aker
92
30
recording medium
61

Fig. 2

channel	program title	broadcast date and time	genre	program summary	television personalities	series information (broadcast mode)
12	News Seven (August 8)	1999/0808/07:00 08:00	news	———	Taro Yamamoto	News Seven (continuous every day/ all year round)
	⋮					
	Total Solar Eclipse (first)	1999/0812/21:00 23:00	documentary	———	Hanako Yamashita Shotaro Kato	Total Solar Eclipse (continuous every day/ 1 of 2)
	Total Solar Eclipse (second)	1999/0813/21:00 23:00	documentary	———	Hanako Yamashita Shotaro Kato	Total Solar Eclipse (continuous every day/ 2 of 2)
10	⋮					
	Holiday in Los Angeles (Part 25 Secret)	1999/0809/21:00 23:00	movie	Story of Tragic Love Set in Los Angeles	John Long Catherine Ross	Holiday in Los Angeles (continuous every week/ 25 of 50)
	Holiday in Los Angeles (Part 26 Informer's Report)	1999/0816/21:00 23:00	movie	Story of Tragic Love Set in Los Angeles	John Long Catherine Ross	Holiday in Los Angeles (continuous every week/ 26 of 50)
08	⋮					
	Professional Baseball Game A vs. B (eighth game)	1999/0810/18:00 21:00	sports	———	———	Professional Baseball Game A vs. B (broadcast interval not determined/ 8 of 12)
06	It Will be Sunny Tomorrow (sixth)	1999/0728/20:00 21:00	drama	———	———	It Will be Sunny Tomorrow (continuous every week/ 6 of 12)
	It Will be Sunny Tomorrow (seventh)	1999/0804/20:00 21:00	drama	———	———	It Will be Sunny Tomorrow (continuous every week/ 7 of 12)
	It Will be Sunny Tomorrow (eighth)	1999/0811/20:00 21:00	drama	———	———	It Will be Sunny Tomorrow (continuous every week/ 8 of 12)
	⋮					

Fig. 3

present time 1999/08/12 20:30 maximum recording time 12 hours program erasure priority criterion broadcast start date and time

channel	program group title	program group recording conditions	program group erasure possibility conditions	recording setter	viewer limitation (password)	program recording condition (recording time)			total usage time
12	News Seven	recording of newest program (1)	erasable	A	nil	recorded (1 hour) 1999/0811/07:00	recorded (1 hour) 1999/0812/07:00		2 hours in total
10	Holiday in Los Angeles	recording of newest program (2)	non-erasable	B	nil	recorded (2 hour) 1999/0809/21:00	set for recording (2 hours) 1999/0816/21:00		4 hours in total
08	Professional Baseball Game A vs. B	———	erasable	A	exists (***)	recorded (3 hour) 1999/0810/18:00			3 hours in total
06	It Will be Sunny Tomorrow	recording of newest program (3)	non-erasable	C	nil	recorded (1 hour) 1999/0728/20:00	recorded (1 hour) 1999/0804/20:00	recorded (1 hour) 1999/0811/20:00	3 hours in total

Fig. 4

present time 1999/08/12 20:30 maximum recording time 12 hours program erasure priority criterion broadcast start date and time

channel	program group title	program group recording conditions	program group erasure possibility conditions	recording setter	viewer limitation (password)	program recording condition (recording time)			total usage time
12	News Seven	recording of newest program (1)	erasable	A	nil	recorded (1 hour) 1999/0811/07:00	recorded (1 hour) 1999/0812/07:00		2 hours in total
10	Holiday in Los Angeles	recording of newest program (2)	non-erasable	B	nil	recorded (2 hour) 1999/0809/21:00	set for recording (2 hours) 1999/0816/21:00		4 hours in total
08	Professional Baseball Game A vs. B	———	erasable	A	exists (***)	recorded (3 hour) 1999/0810/18:00			3 hours in total
06	It Will be Sunny Tomorrow	recording of newest program (3)	non-erasable	C	nil	recorded (1 hour) 1999/0728/20:00	recorded (1 hour) 1999/0804/20:00	recorded (1 hour) 1999/0811/20:00	3 hours in total
12	Total Solar Eclipse	recording of programs (all)	non-erasable	A	nil	set for recording (2 hours) 1999/0812/21:00	set for recording (2 hours) 1999/0813/21:00		4 hours in total

Fig. 5

present time 1999/08/12 20:41 maximum recording time 12 hours program erasure priority criterion broadcast start date and time

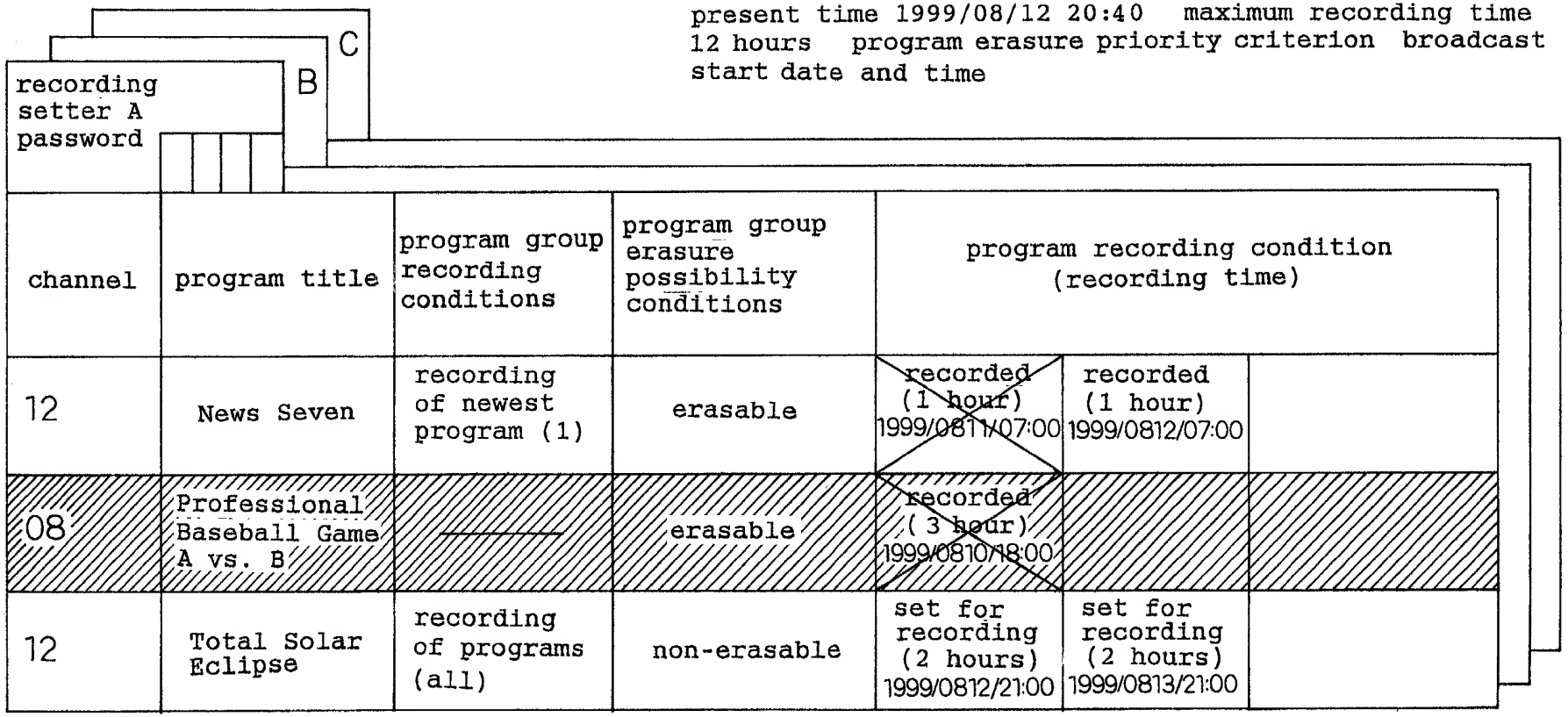
channel	program group title	program group recording conditions	program group erasure possibility conditions	recording setter	viewer limitation (password)	program recording condition (recording time)			total usage time
12	News Seven	recording of newest program (1)	erasable	A	nil	recorded (1 hour) 1999/0811/07:00	~~recorded (1 hour) 1999/0812/07:00~~		2 hours in total
10	Holiday in Los Angeles	recording of newest program (2)	non-erasable	B	nil	recorded (2 hour) 1999/0809/21:00	set for recording (2 hours) 1999/0816/21:00		4 hours in total
08	Professional Baseball Game A vs. B	———	erasable	A	exists (***)	~~recorded (3 hour) 1999/0810/18:00~~			3 hours in total
06	It Will be Sunny Tomorrow	recording of newest program (3)	non-erasable	C	nil	recorded (1 hour) 1999/0728/20:00	recorded (1 hour) 1999/0804/20:00	recorded (1 hour) 1999/0811/20:00	3 hours in total
12	Total Solar Eclipse	recording of programs (all)	non-erasable	A	nil	set for recording (2 hours) 1999/0812/21:00	set for recording (2 hours) 1999/0813/21:00		4 hours in total

Fig. 6

present time 1999/08/13 21:00 maximum recording time 12 hours program erasure priority criterion broadcast start date and time

channel	program group title	program group recording conditions	program group erasure possibility conditions	recording setter	viewer limitation (password)	program recording condition (recording time)			total usage time
12	News Seven	recording of newest program (1)	erasable	A	nil	recorded (1 hour) 1999/0811/07:00	recorded (1 hour) 1999/0812/07:00		2 hours in total
10	Holiday in Los Angeles	recording of newest program (2)	non-erasable	B	nil	recorded (2 hour) 1999/0809/21:00	set for recording (2 hours) 1999/0816/21:00		4 hours in total
06	It Will be Sunny Tomorrow	recording of newest program (3)	non-erasable	C	nil	recorded (1 hour) 1999/0728/20:00	recorded (1 hour) 1999/0804/20:00	recorded (1 hour) 1999/0811/20:00	3 hours in total
12	Total Solar Eclipse	recording of programs (all)	non-erasable	A	nil	recorded (2 hour) 1999/0812/21:00	recording (2 hours) 1999/0813/21:00		4 hours in total

Fig. 7



channel	program title	program group recording conditions	program group erasure possibility conditions	program recording condition (recording time)		
12	News Seven	recording of newest program (1)	erasable	recorded (1 hour) 1999/0811/07:00	recorded (1 hour) 1999/0812/07:00	
08	Professional Baseball Game A vs. B	———	erasable	recorded (3 hour) 1999/0810/18:00		
12	Total Solar Eclipse	recording of programs (all)	non-erasable	set for recording (2 hours) 1999/0812/21:00	set for recording (2 hours) 1999/0813/21:00	

Fig. 8

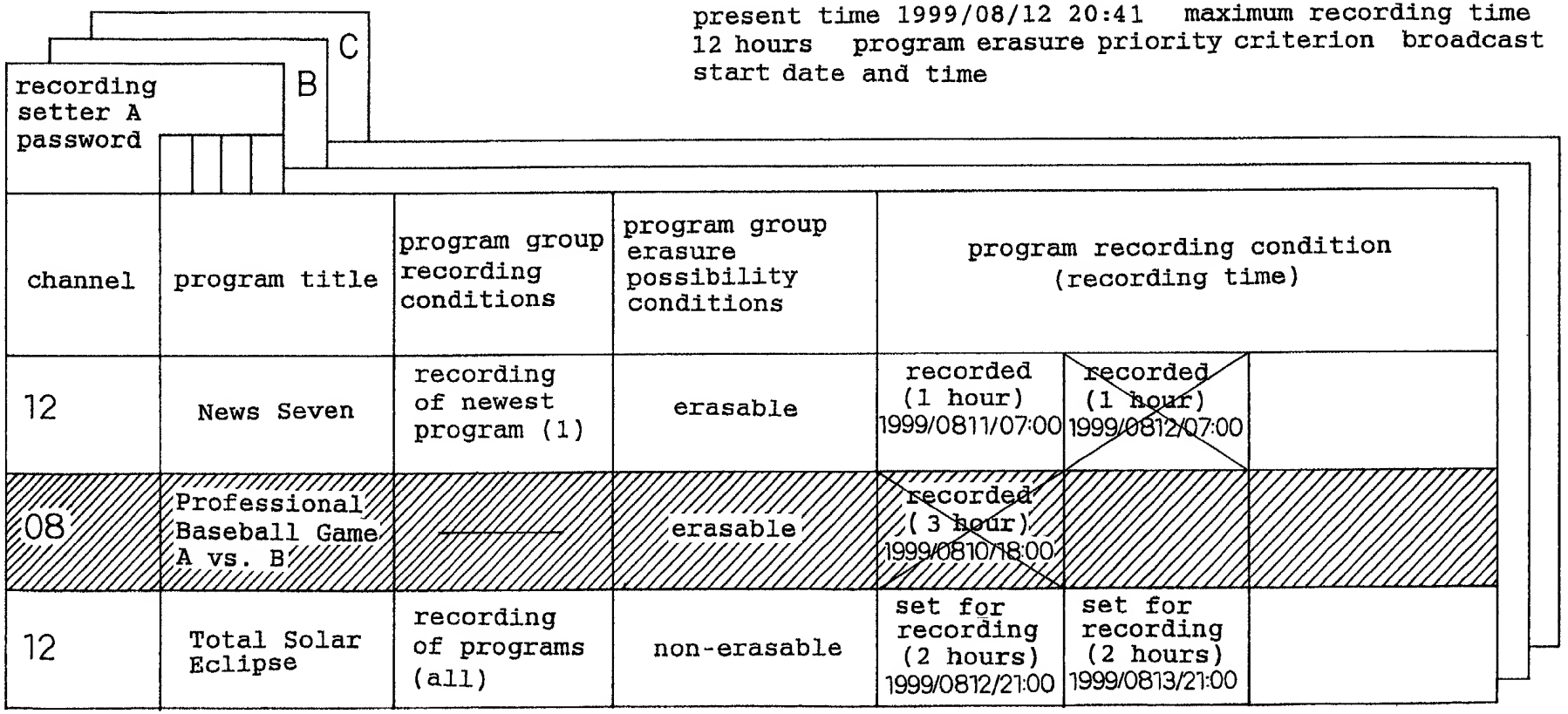

present time 1999/08/12 20:41 maximum recording time 12 hours program erasure priority criterion broadcast start date and time
recording setter A password
B
C
channel
program title
program group recording conditions
program group erasure possibility conditions
program recording condition (recording time)
12
News Seven
recording of newest program (1)
erasable
recorded (1 hour) 1999/0811/07:00
recorded (1 hour) 1999/0812/07:00
08
Professional Baseball Game A vs. B
erasable
recorded (3 hour) 1999/0810/18:00
12
Total Solar Eclipse
recording of programs (all)
non-erasable
set for recording (2 hours) 1999/0812/21:00
set for recording (2 hours) 1999/0813/21:00

Fig. 9

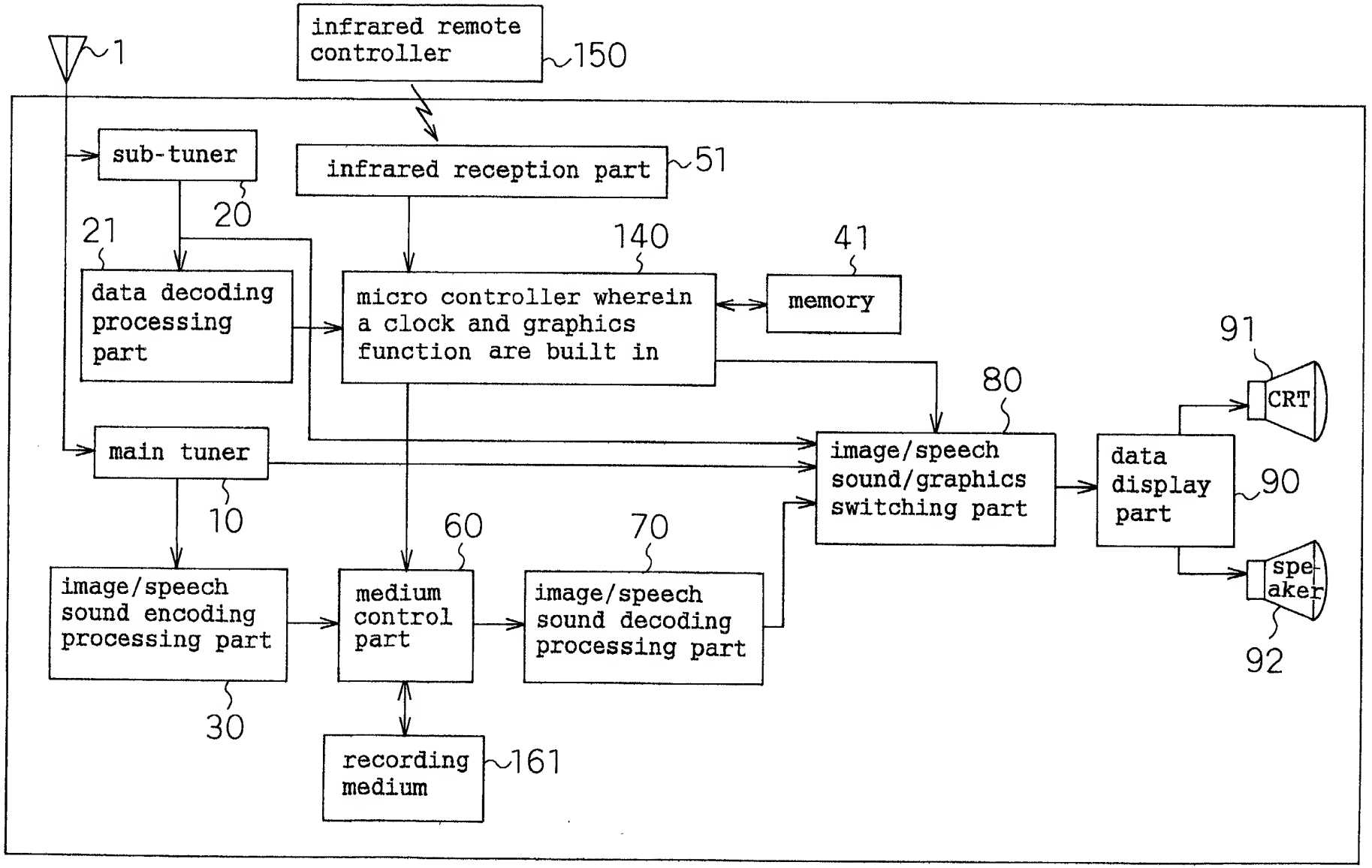

1
infrared remote controller
150
sub-tuner
20
infrared reception part
51
21
140
41
data decoding processing part
micro controller wherein a clock and graphics function are built in
memory
91
CRT
80
main tuner
10
image/speech sound/graphics switching part
data display part
90
60
70
image/speech sound encoding processing part
medium control part
image/speech sound decoding processing part
speaker
92
30
recording medium
161

Fig. 10

present time 1997/04/09 10:00
maximum recording capacity 8.5GB

recorded program

program title		program recording capacity	broadcast start date and time	number of playbacks/dubbings	erasure possibility
12ch	News ABC	1GB	97/04/01 18:01	1	erasable
2ch	Drama XYZ	1GB	97/04/01 19:00	1	non-erasable
6ch	Baseball Game ab vs. cd 01	2GB	97/03/18 18:00	1	erasable
6ch	Baseball Game ab vs. cd 02	2GB	97/03/19 18:00	0	erasable
12ch	English Conversation 3	0.5GB	97/03/18 06:00	5	erasable
12ch	News CDF 2	1GB	97/04/08 18:01	1	erasable
4ch	Drama XXX	1GB	97/04/08 19:00	0	erasable

capacity management	already recorded capacity 8.5GB vacant capacity 0GB re-writable capacity 7.5GB non-erasable capacity 1GB

programs set for recording

program title		program recording capacity	broadcast start date and time	number of playbacks/dubbings	erasure possibility
6ch	Baseball Game ab vs. cd 12	3GB	97/04/09 18:00	0	non-erasable

capacity management	capacity for programs set for recording 3GB potential capacity for programs set for recording 4.5GB

Fig. 11

present time 1997/04/09 10:10
maximum recording capacity 8.5GB

recorded program

program title		program recording capacity	broadcast start date and time	number of playbacks/dubbings	erasure possibility
12ch	News ABC	1GB	97/04/01 18:01	1	erasable
2ch	Drama XYZ	1GB	97/04/01 19:00	1	erasable
6ch	Baseball Game ab vs. cd 01	2GB	97/03/18 18:00	1	erasable
6ch	Baseball Game ab vs. cd 02	2GB	97/03/19 18:00	0	erasable
12ch	English Conversation 3	0.5GB	97/03/18 06:00	5	non-erasable
12ch	News CDF 2	1GB	97/04/08 18:01	1	erasable
4ch	Drama XXX	1GB	97/04/08 19:00	0	erasable

capacity management	recorded capacity 8.5GB vacant capacity 0GB re-writable capacity 8GB non-erasable capacity 0.5GB

programs set for recording

program title		program recording capacity	broadcast start date and time	number of playbacks/dubbings	erasure possibility
6ch	Baseball Game ab vs. cd 12	3GB	97/04/09 18:00	0	non-erasable
6ch	Baseball Game ab vs. cd 13	1.5GB	97/04/12 18:00	0	erasable

capacity management	capacity for programs set for recording 4.5GB potential capacity for programs set for recording 3.5GB

Fig. 12

present time 1997/04/09 10:00
maximum recording capacity 8.5GB

program erasure priority criterion		program title	program recording capacity	erasure priority	erasure plan (date and time)
playback number	broadcast start date and time				
playback once	97/03/18 18:00	Baseball Game ab vs. cd 01	2GB	first	erasure plan (4/9 18:00)
	97/04/01 18:01	News ABC	1GB	second	erasure plan (4/9 18:00)
	97/04/01 19:00	Drama XYZ	1GB	non-erasable	
	97/04/08 18:01	News CDF	1GB	third	
playback twice or more	97/03/18 06:00	English Conversation 3	0.5GB	fourth	
no playback	97/03/19 18:00	Baseball Game ab vs. cd 02	2GB	fifth	
	97/04/08 19:00	Drama XXX	1GB	sixth	
set for recording	97/04/09 18:00	Baseball Game ab vs. cd 12	3GB	non-erasable	

Fig. 13

present time 1997/04/09 10:10
maximum recording capacity 8.5GB

program erasure priority criterion		program title	program recording capacity	erasure priority	erasure plan (date and time)
playback number	broadcast start date and time				
playback once	97/03/18 18:00	Baseball Game ab vs. cd 01	2GB	first	erasure plan (4/9 18:00)
	97/04/01 18:01	News ABC	1GB	second	erasure plan (4/9 18:00)
	97/04/01 19:00	Drama XYZ	1GB	third	erasure plan (4/12 18:00)
	97/04/08 18:01	News CDF	1GB	fourth	erasure plan (4/12 18:00)
playback twice or more	97/03/18 06:00	English Conversation 3	0.5GB	non-erasable	
no playback	97/03/19 18:00	Baseball Game ab vs. cd 02	2GB	fifth	
	97/04/08 19:00	Drama XXX	1GB	sixth	
set for recording	97/04/09 18:00	Baseball Game ab vs. cd 12	3GB	non-erasable	
	97/04/12 18:00	Baseball Game ab vs. cd 13	1.5GB	seventh	

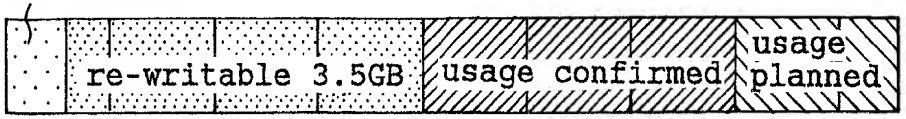
Fig. 14

screen

present time 1997/04/09 10:00

broadcast start date and time	program title	program recording capacity	erasure priority	erasure plan (date and time)	manual erasing/setting of release of recording
97/03/18 18:00	Baseball Game ab vs. cd 01	2GB	first	erasure plan (4/9 18:00)	☐
97/04/01 18:01	News ABC	1GB	second	erasure plan (4/9 18:00)	☐
97/04/01 19:00	Drama XYZ	1GB	non-erasable		☐
97/04/08 18:01	News CDF	1GB	third	erasure plan (4/12 18:00)	☐
97/03/18 06:00	English Conversation 3	0.5GB	fourth	erasure plan (4/12 18:00)	☐
97/03/19 18:00	Baseball Game ab vs. cd 02	2GB	fifth		☐
97/04/08 19:00	Drama XXX	1GB	sixth		☐
97/04/09 18:00	Baseball Game ab vs. cd 12	3GB	non-erasable	set for recording	☐
97/04/12 18:00	Baseball Game ab vs. cd 13	1.5GB	seventh	set for recording	☐

non-erasable



return

release

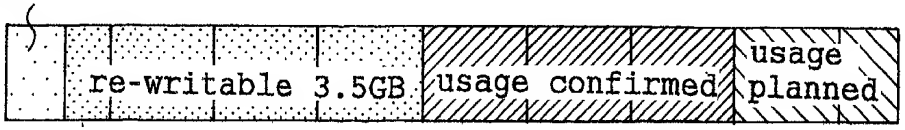
Fig. 15

screen

present time 1997/04/09 10:10

broadcast start date and time	program title	program recording capacity	erasure priority	erasure plan (date and time)	manual setting of release of erasing/recording
97/03/18 18:00	Baseball Game ab vs. cd 01	2GB	first	erasure plan (4/9 18:00)	☐
97/04/01 18:01	News ABC	1GB	second	erasure plan (4/9 18:00)	☐
97/04/01 19:00	Drama XYZ	1GB	third	erasure plan (4/12 18:00)	☐
97/04/08 18:01	News CDF	1GB	fourth	erasure plan (4/12 18:00)	☐
97/03/18 06:00	English Conversation 3	0.5GB	non-erasable		☐
97/03/19 18:00	Baseball Game ab vs. cd 02	2GB	fifth		☐
97/04/08 19:00	Drama XXX	1GB	sixth		☐
97/04/09 18:00	Baseball Game ab vs. cd 12	3GB	non-erasable	set for recording	☐
97/04/12 18:00	Baseball Game ab vs. cd 13	1.5GB	seventh	set for recording	☐

non-erasable



return

release

Fig. 16

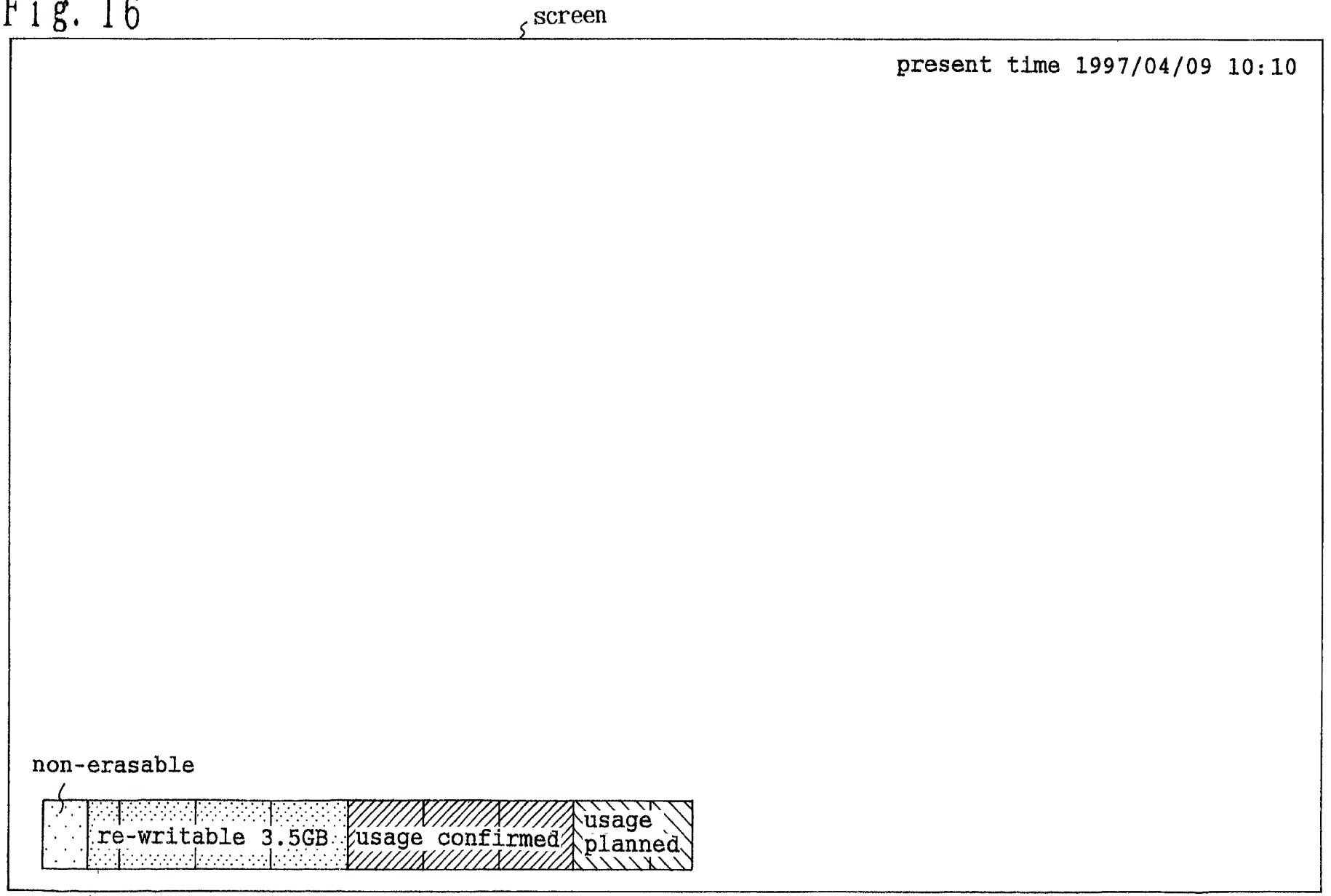

screen
present time 1997/04/09 10:10
non-erasable
re-writable 3.5GB
usage confirmed
usage planned

Fig. 17

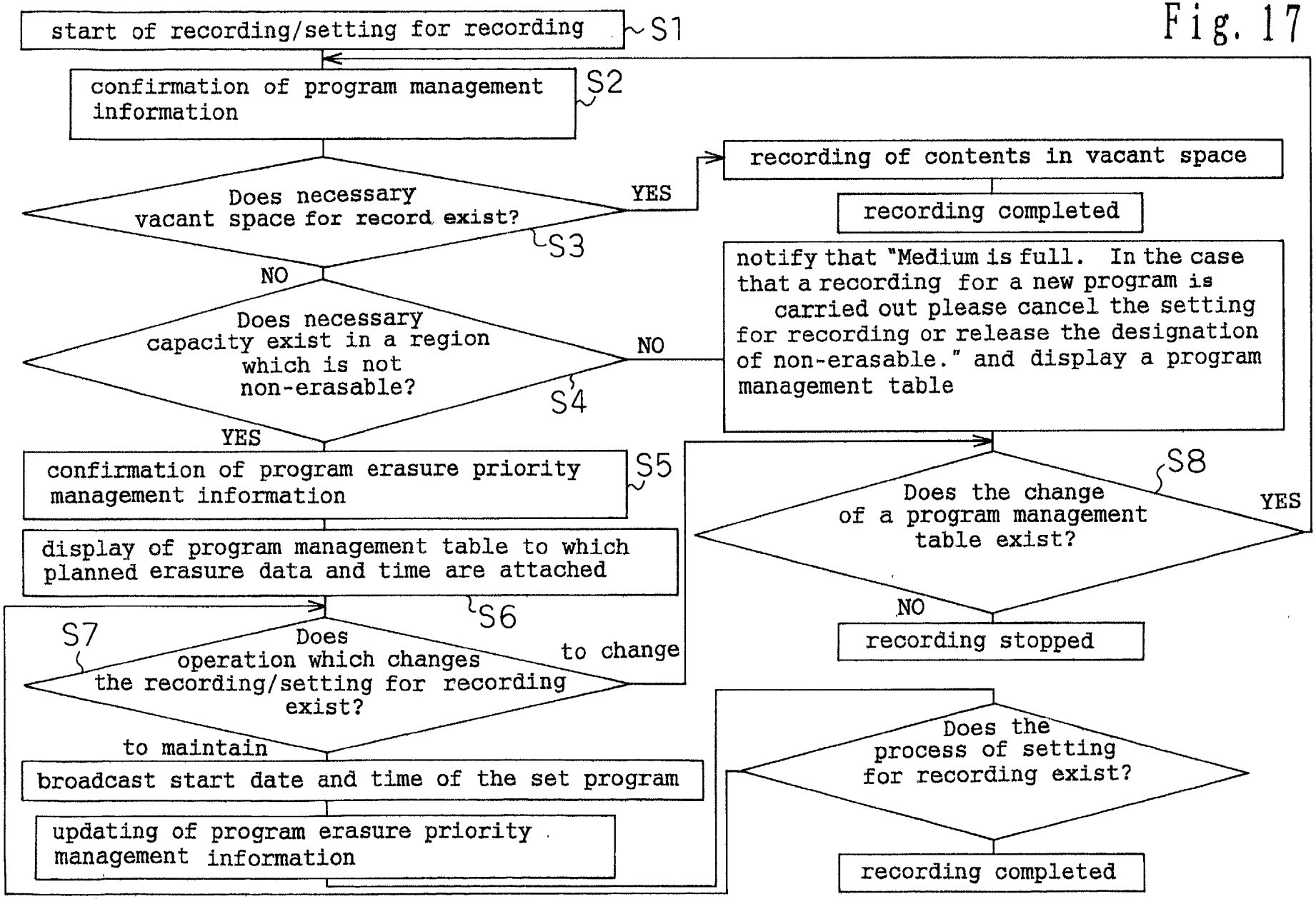

start of recording/setting for recording
S1
confirmation of program management information
S2
Does necessary vacant space for record exist?
S3
YES
recording of contents in vacant space
recording completed
NO
Does necessary capacity exist in a region which is not non-erasable?
S4
NO
notify that "Medium is full. In the case that a recording for a new program is carried out please cancel the setting for recording or release the designation of non-erasable." and display a program management table
YES
confirmation of program erasure priority management information
S5
display of program management table to which planned erasure data and time are attached
S6
S7
Does operation which changes the recording/setting for recording exist?
to change
to maintain
broadcast start date and time of the set program
updating of program erasure priority management information
S8
Does the change of a program management table exist?
YES
NO
recording stopped
Does the process of setting for recording exist?
recording completed

Fig. 18 PRIOR ART

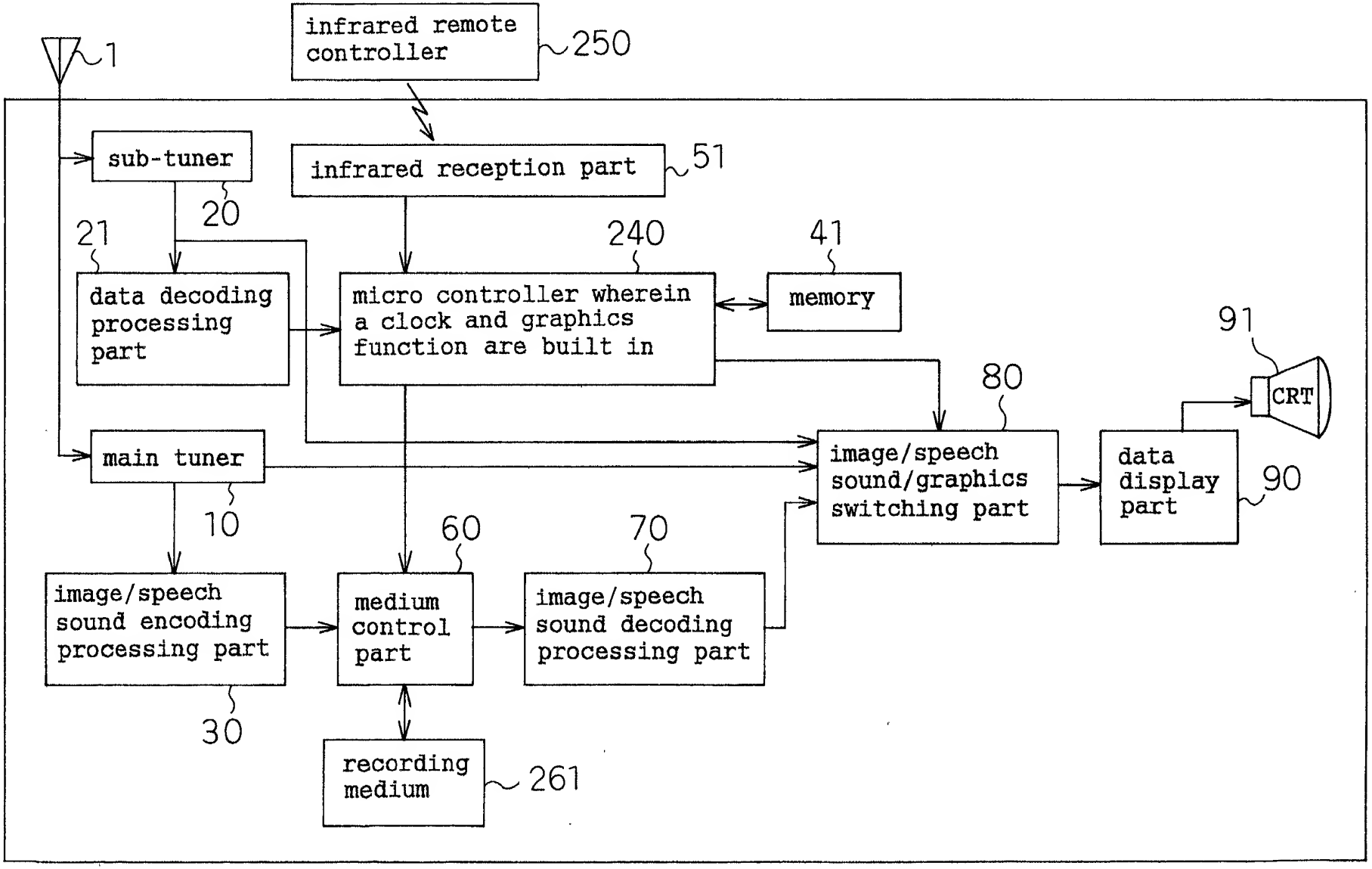


Fig. 19 PRIOR ART

present time 1999/08/12 20:30 maximum recording time 12 hours program erasure priority criterion broadcast start date and time

channel	program group title	program group recording conditions	program recording condition (recording time)		
12	News Seven	recording of newest program (1)	recorded (1 hour) 1999/0811/07:00	recorded (1 hour) 1999/0812/07:00	
10	Holiday in Los Angeles	recording of newest program (2)	recorded (2 hour) 1999/0809/21:00	set for recording (2 hours) 1999/0816/21:00	
08	Professional Baseball Game A vs. B	———	recorded (3 hour) 1999/0810/18:00		
06	It Will be Sunny Tomorrow	recording of newest program (3)	recorded (1 hour) 1999/0728/20:00	recorded (1 hour) 1999/0804/20:00	recorded (1 hour) 1999/0811/20:00

Fig. 20 PRIOR ART

present time 1999/08/12 20:30 maximum recording time 12 hours program erasure priority criterion broadcast start date and time

channel	program group title	program group recording conditions	program recording condition (recording time)		
12	News Seven	recording of newest program (1)	recorded (1 hour) 1999/0811/07:00	recorded (1 hour) 1999/0812/07:00	
10	Holiday in Los Angeles	recording of newest program (2)	recorded (2 hour) 1999/0809/21:00	set for recording (2 hours) 1999/0816/21:00	
08	Professional Baseball Game A vs. B	———	recorded (3 hour) 1999/0810/18:00		
06	It Will be Sunny Tomorrow	recording of newest program (3)	recorded (1 hour) 1999/0728/20:00	recorded (1 hour) 1999/0804/20:00	recorded (1 hour) 1999/0811/20:00
12	Total Solar Eclipse	recording of programs (all)	set for recording (2 hours) 1999/0812/21:00	set for recording (2 hours) 1999/0813/21:00	

Fig. 21 PRIOR ART

present time 1999/08/12 21:00 maximum recording time 12 hours program erasure priority criterion broadcast start date and time

channel	program group title	program group recording conditions	program recording condition (recording time)		
12	News Seven	recording of newest program (1)	recorded (1 hour) 1999/0811/07:00	recorded (1 hour) 1999/0812/07:00	
10	Holiday in Los Angeles	recording of newest program (2)	recorded (2 hour) 1999/0809/21:00	set for recording (2 hours) 1999/0816/21:00	
08	Professional Baseball Game A vs. B	———	recorded (3 hour) 1999/0810/18:00		
06	It Will be Sunny Tomorrow	recording of newest program (3)	recorded (1 hour) 1999/0728/20:00	recorded (1 hour) 1999/0804/20:00	recorded (1 hour) 1999/0811/20:00
12	Total Solar Eclipse	recording of programs (all)	recording (2 hours) 1999/0812/21:00	set for recording (2 hours) 1999/0813/21:00	

UNITED STATES (Form BDWY-1)
Patents and Design Patents
Sole & Joint Inventors
Convention & Non-convention
PCT & Non-PCT
This form cannot be amended, altered or changed after it is signed.
(For use only for inventors who understand the English language.)

Declaration and Power of Attorney
United States Patent Application

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name.
I believe I am the original, first and sole inventor *(if only one name is listed below)* or an original, first and joint inventor *(if plural names are listed below)* of the subject matter which is claimed and for which a patent is sought on the invention entitled

PROGRAM RECORDING APPARATUS AND PROGRAM RECORDING MEDIUM,

(check one) ☒ is attached hereto.
☐ was filed as U.S. Application No._____ on _____ and *(if applicable)* was amended on _____.
☐ was filed as PCT International Application No._____ on _____ and *(if applicable)* was amended under PCT Article 19 on _____.
(I authorize any attorney appointed below to insert information in the preceding blanks.)

I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or §365(b) of any foreign and PCT application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designated at least one country other than the United States of America listed in this Declaration. I have also identified below any foreign application for patent or inventor's certificate or PCT international application having a filing date before that of the application(s) on which priority is claimed:

Foreign/PCT Application No.	Country	Filing Date	Priority Claimed? (yes/no)
Hei 11-341,024	JAPAN	November 30, 1999	YES

I hereby claim the benefit under Title 35, United States Code, §120 or §365(c) of any United States application and PCT international application designating the United States of America listed in this Declaration and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application or PCT international application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

U.S. Application No.	Filing Date	*Status (patented/pending/abandoned?)*

I hereby claim priority benefits under Title 35 United States Code §119(e) of any U.S. provisional application(s) listed below:

U.S. Provisional Application No.	Filing Date

I hereby appoint the following attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: Joseph A. DeGrandi (17446), Robert G. Weilacher (20531), Richard G. Young (20628), Michael A. Makuch (32263), Dennis C. Rodgers (32936), Thomas L. Evans (35805), Frank C. Cimino, Jr. (39945), Carolyn Favorito (39183), George A. Metzenthin (P41995), and Steven W. Collier (P42429).

Send all correspondence to Beveridge, DeGrandi, Weilacher & Young, L.L.P., Suite 800, 1850 M Street, N.W., Washington, D.C. 20036. Facsimiles may be sent to (202) 659-1462. Direct all telephone calls to (202) 659-2811.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor: Hirofumi WADA Citizenship: JAPAN
Residence *(city, state, country)*: Toyonaka-shi, Osaka JAPAN
Post office address: 3-13-31-404, Chokojikita, Toyonaka-shi, Osaka 561-0875 JAPAN

Signature: Hirofumi Wada Date: November 17, 2000

Full name of second joint inventor, if any: Hiroshi YASUNO Citizenship: JAPAN
Residence *(city, state, country)*: Shijonawate-shi, Osaka JAPAN
Post office address: 5-3-32, Okayamahigashi, Shijonawate-shi, Osaka 575-0003 JAPAN

Signature: Hiroshi Yasuno Date: November 17, 2000

☐ Additional inventors and/or prior applications are listed in attached Supplemental Sheet(s).

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